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The Institute of Vitreous Enamellers

The Welsh Engineers' and Founders' Association

and

The Foundry Trades' Equipment and Supplies Association

Institute of British Foundrymen

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An Unsolved Problem

Much of the time of the annual general meeting of the Foundry Trades Equipment and Supplies Association was taken up with a consideration of an exhibition policy, but no definite result was achieved. It is common ground that trade exhibitions should be held periodically, but it is fairly well agreed that one every two years is too frequent, as the Annual Report of the Association, printed elsewhere in this issue reveals; indeed, some prominent firms have not exhibited for a decade. This getting out of step is probably due to "over-frequency," for with the knowledge that a postponement of only two years is necessary, a ready-made excuse is available. Let it be announced that a prolonged period is to elapse before the holding of an exhibition, the present objection of " unrepresentative " would disappear. The problem is complicated by the fact that the requirements of the foundry machinery builders are different from those supplying raw materials. The former have to consider whether they have developed anything really novel since the last exhibition, the cost of foundations, transport and power incidental to the showing of heavy plant, whilst the latter must take into consideration the market conditions, and the importance of the foundry industry requirements in relation to the rest of their general trade. Both must be influenced by the enthusiasm of the castings manufacturers and their staff for any particular exhibition. It has been stated that when a foundry equipment exhibition is held in conjunction with an engineering show, the actual foundry staff have difficulty in attending, because a decision is often taken for the event to be covered by executives from other departments, whereas when the show is labelled " foundry " such conditions do not obtain. It is stressed in the Report that only one foundry exhibition organised under the ægis of the Association has been a financial success, and that was due to co-operation with the Imported Machine Tool Association. The present position of showing biennially at Olympia in conjunction with the Engineering and Marine Exhibition, unless continuous support is given is in danger of losing its accustomed terrain, because it is an unwritten rule in exhibition organising that an exhibitor has a moral prior lien on exactly the same position that was occupied at a previous show. It is thus obvious, that the Association must commit itself to supporting the Olympia show biennially or make other arrangements. Possibilities which suggest themselves are experiments in the direction of testing out the provincial centres at more widely spaced intervals, or a prolonged holiday from exhibitions until sufficient enthusiasm could be engendered to assure a successful show, say at the Agricultural Hall. The present system of biennial exhibition which is reasonably well supported by the suppliers of raw material for the foundry industry, commands a wider public than a purely " foundry " show; it enables the plant manufacturers to exhibit at reasonably short intervals, recently-developed plant. That there are arguments in its favour is shown by the fact that for the forthcoming exhibition to be held in September, very little space is now available. With a few outstanding examples, however, the support given by the best known foundry equipment firms is, to say the least of it, fairly meagre. There will be three or four moulding machinery firms showing, some of the best examples of shot blasting; the two principal manufacturers of electro-magnets and a fair display of melting plant; the raw material side is well represented. The new President of the " Equipment Association," Mr. G. E. France, managing director of Augusts Limited, is carefully studying the position and he would welcome constructive suggestions for the resolution of what is admitted to be a complex problem amongst the supplies of foundry plant and raw material. As the foundry executive can also be regarded as a partner in such enterprises his views would also be appreciated.

Uncertain Spelter Outlook

By "Onlooker."

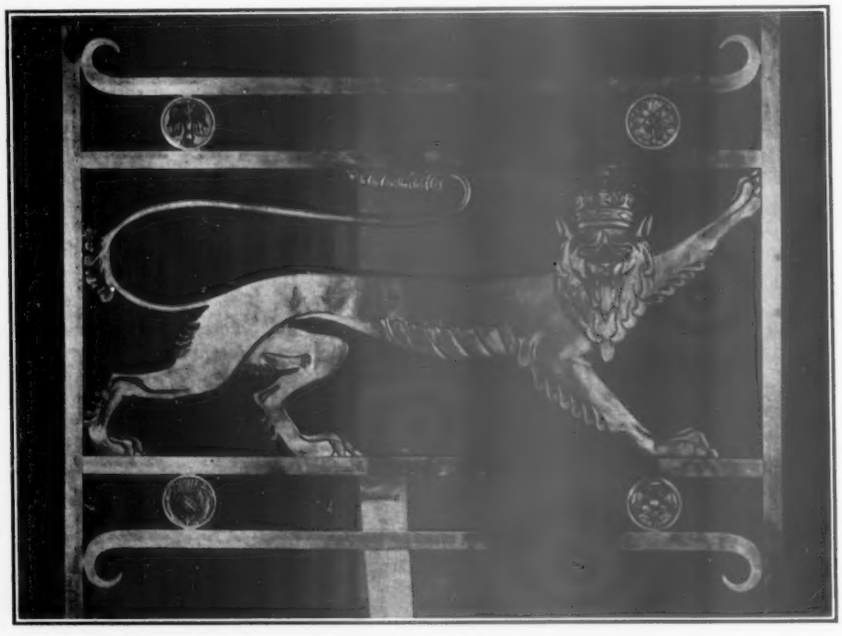
The long delay in settling the revision of the spelter duty has led to talk of difficulties and disputes among those concerned, but actually it seems likely that a decision has been reached as to the new conditions even though the increase in the rate of the import levy cannot fail to be unpalatable to the many consumers of the metal in this country. More than that the increase in the cost of an important raw material will come at a time when, apart from special needs in connection with A.R.P. measures and rearmament, demand is extremely disappointing. However, the authorities believe that the zinc producing industry in this country must be kept going and they have apparently decided that the consumers of the metal are the right people to find the money for this purpose; if and when the scheme is put into operation time will show whether this opinion is a sound one. In the meanwhile business in the metal is poor, both on the Metal Exchange and outside, the call for high grade being particularly slow, due probably to the fact that many consumers are well stocked and not in any mood to increase their commitments. After all, why should they, for the new duty contemplated for spelter can only result, unless a cartel is formed, in depressing the price on the London market still further. This happened before when the rate was 10 per cent. and was one of the main reasons why an adjustment to a flat rate of 12s. 6d. was adopted.

One-Way Traffic

All along of course there has been the difficulty of attracting business to the metal exchange and offsetting by purchasing power the downward thrust exercised by sales made by Continental producers who intended to ship to this country for storage in bonded warehouses, and hedging sales by those who wished to protect their position in concentrates. This "one-way traffic," as it has been called, constitutes a very real problem and one which is going to take some solving even if a cartel is achieved, an event which in view of the German position is not going to be very easy. In any case limitation of output in spelter presents certain peculiar difficulties, for as everyone knows this metal is produced often enough as a by-product or on account of special circumstances. Another point, and it is an important one, which has to be borne in mind in considering this question of cutting down output, is the fact that as far as the United Kingdom is concerned the onus of providing adequate supplies lies with the Empire producers who were given this market when a duty was first imposed. It is quite certain that the consumers, smarting under what they feel is an injustice in the shape of a big increase in the import duty, will watch very jealously any move towards interference with the normal rate of output since this will be done with the avowed object of raising the price level. In actual fact the taxation of raw material is a retrograde step and it is not wonderful that users of spelter feel very sore about the present position.

In considering the spelter situation one has to bear in mind that the basis of much of the world's production to-day is electrolytic and that in order to meet the needs of this country producers are obliged to debase the high-grade product so as to have a quality approximating to G.O.B. for such trades as require it. It naturally costs money to bring the quality down from 99.9 per cent. to 99 per cent., and to make matters worse the lower-grade spelter naturally commands a cheaper price. The L.M.E. contract was of course drawn up to cope with ordinary G.O.B. qualities and the amount of special spelter traded in Whittington Avenue is negligible. Can the Exchange attract the type of spelter which is now normally passing into consumption in this country? It seems doubtful unless the form of the L.M.E. contract is altered.

Cook & Company, Limited, has been registered in Sydney, with a capital of £250,000, with the object of developing the iron-ore deposits at Burnie, in Tasmania. The concern proposes to manufacture pig-iron by an electrical smelting process and to make castings, pipes, alloys and other products.



One of a Number of Cast Bronze Lions Incorporated in the Nickel Silver Doorways for the British Pavilion at the New York World's Fair. The Castings were Made by the Corinthian Bronze Company, Limited, and the Doors executed by J. Storkie Gardner, Limited. The Picture is reproduced by courtesy of the Bureau of Information on Nickel.

Random Shots

At last a solution has been sent in to the Monkey Puzzle which was recently set forth in this column. The solver did not disclose his name, which gives rise to a suspicion that he and the sender are one and the same person. It does not need much knowledge of human frailty to assume that any independent solver of such a monkey of a puzzle would be proud to broadcast the fact, and indeed he would be thoroughly justified in doing so! The length of the rope is exactly 7 feet, but to show just how that answer is reached would require more rope than the Editor is likely to give. Suffice it to say that it takes three foolscap pages of closely worked-out mathematics, and that if anyone has any spare time in which to study it, a copy will be gladly sent to him!

* * *

A trade note states that during the last twelve months all the departments of Messrs. Blank & Blank have been taxed to full capacity. They are lucky. Most firms complain that they have been nearly taxed out of existence for years!

* * *

Which reminds one that times are hard indeed, but epigrams such as are to be found in Mr. Coleman's new catalogue certainly do help to keep one cheerful. The following selection is chosen from his many words to the wise, weary, or woe-begone. . . .

If you cannot dodge trouble, step on the gas and hit it head on.

When you come to the end of your rope, tie a knot in it and hang on.

Cheer up! Remember the old tea kettle. Always up to the neck in hot water and still keeps on smiling.

* * *

Apropos of wise epigrams and good stories, "Marksman" has been favoured by instructions from Mr. Barrington Hooper to dispose of a collection which he compiled a year or two ago, and which is now to be offered to the public for the first time. This superb collection, neatly arranged in loose-leaf form, contains some hundreds of specimens, all in good condition and very tellable; some used, not to mention a few period. This magnificent collection of really good moderns will be split into lots which will be submitted for view each week in this column.

* * *

Lot 1 from the Barrington Hooper collection:—

"Buy a cheap secondhand car and you will find how hard it is to drive a bargain."

* "Why is it that they always speak of doctors 'practising'?"

* St. Peter: "How did you get here?"
New Arrival: "'Flu!"

* The last two cannot be sold separately.

Marksman.

National Savings Holiday Schemes

Wide attention has lately been drawn to the schemes put forward by the National Savings Committee for the encouragement of saving for holiday purposes. The schemes have been adopted by a large number of firms in many trades. One of the main reasons for the success of the schemes is the fact that they have been given commendation by many important trade federations. The following are among the organisations which have supported the schemes in this way: Mining Association; Engineering and Allied Employers' National Federation; Dock and Harbour Authorities; National Federation of Vehicle Trades; Iron and Steel Trades Employers' Association. Similar action has been taken by certain leading trades unions.

Bearing Metals for High-Speed Engines

By a Metallurgical Correspondent.

The development of high-speed internal-combustion engines has taxed very considerably the orthodox white bearing metals, and much research work has been carried out during recent years in order to produce bearing alloys of superior properties, which will satisfactorily withstand the severe conditions now being imposed. This experimental work has led to the development of the copper-lead, hardened lead, cadmium-base, and silver-bearing alloys, and such alloys have done much to meet these new conditions.

The copper-lead alloys and the cadmium-base alloys have been used principally in the U.S.A., and the lead-base or hardened lead alloys in Germany. All these alloys are now being used to an increasing extent in this country, not only in the motor-vehicle and aircraft industries, but also to a more limited extent in marine and general engineering. The use of silver for bearing purposes is of more recent development, experimental work on this metal having been carried out in the United States.

Copper-Lead and Hardened-Lead Bearings

Copper-lead bearing alloys usually contain from 25 to 45 per cent. of lead, with copper the remainder. Small amounts of other elements, such as tin or silver, are sometimes added, the most recent addition being 1 per cent. of lithium, in order to reduce segregation tendencies. Copper-lead alloys have excellent bearing properties, where very high loads must be sustained, especially at high temperatures, and also where overstress may occur. Due to their dendritic structure, however, their strength is low, and they are subject to failure by fatigue cracking. The addition of tin causes a change in structure which increases the strength sufficiently to prevent fatigue cracking, but, because of the difference in structure or some other effect of the tin, the alloy is not as good a bearing, and in times of overstress may seize. Tin additions also cause a sacrifice in the anti-score properties, which in any case are well below those obtained with white bearing alloys. When properly cast, either by ordinary or centrifugal methods or by coating mild steel strip, followed in either case by proper cooling, copper-lead is firmly bonded to the steel with copper only.

Cadmium-Base Alloys

Cadmium-base alloys consist essentially of cadmium with a small proportion of nickel or of tin and silver or tin and magnesium. Such alloys have a higher tensile and compressive strength, a greater hardness and a higher fatigue value than tin-base alloys or hardened lead alloys. They give a good bond on steel or brass, the bonding alloy being a eutectic of zinc and cadmium. Cadmium-base alloys are susceptible to corrosive attack by hot oil, but such attack may be retarded by plating indium on to the finished bearing.

The addition of 1 to 2 per cent. of tin and small proportions of other elements such as calcium, cadmium, arsenic, copper, sodium or magnesium has the effect of hardening lead and rendering it suitable as a bearing metal with properties superior to those obtained in white bearing alloys, except that such alloys are more susceptible to corrosive attack. Lead hardened bearings are being increasingly used for many types of internal-combustion engine bearings.

Silver Alloys

The failure of copper-lead alloys and copper-lead-tin alloys in aircraft engines (in the case of the former due to fatigue cracking, and the latter to seizing in times of overstress) has led recently to considering the possibilities of silver or silver-rich alloys as bearing materials. Experimental work has shown that silver has a better seizure resistance than either of the alloys mentioned, and that the purer the silver the greater the seizure resistance. Additions of all elements to silver are harmful to the seizure resistance; some elements, such as antimony, calcium and phosphorus, are very undesirable, while others, such as lead, tin, zinc and cadmium, are less harmful.

Silver adheres strongly to steel, but is difficult to bond, and behaves erratically in engine tests, due, it is believed, to a lack of oiliness. To overcome this lack of oiliness in silver bearings, experiments are being carried out to alloy silver with some element, such as lead or sulphur, which forms a separate phase and does not show oiliness effects, or to blend the oil with some additional agent, such as sulphur, which wets the surface of the silver and so promotes oiliness.

Catalogues Received

Sand-Testing Materials. Thomas & Isaac Bradley, Limited, of Darlaston, Staffs, have prepared an eight-page booklet covering sand testing apparatus manufactured by the George Fischer Iron & Steel Works, of Schaffhausen, Switzerland, and the August-Simpson laboratory-size mixer. The Swiss-made machines include a rammer and core box for making test-pieces; permeability apparatus; sieving machines; compression tests; a novel method of moisture testing by inducing a current of hot air through thin layers of sand; a clay content determination apparatus; a mould-hardness tester, and various auxiliary fitments. The outstanding importance of sand testing is such that all literature, be it trade or technical, should be obtained and filed. This one which is available to our readers on request to Darlaston, is of major interest because it describes apparatus which is not yet very familiar to the industry.

Reducing Valves. Leaflet No. 3,811 issued by Hopkinsons, Limited, of Huddersfield, describes and illustrates half a dozen different types of reducing valves.

Publications Received

Welwyn. Issued by the Industrial Department, Welwyn Garden City, Limited, Welwyn, Herts.

It should be emphasised that Welwyn Garden City is not a distressed area, but from personal contact with the factories installed there the reviewer is aware that it ameliorates the general situation by drafting youths from these districts and establishing them in salubrious surroundings.

Phases of foundry work are represented by a branch of the Allied group, a vitreous enamel frit factory and a grinding wheel works. The achievements and potentialities as a manufacturing and residential centre are well set out in this well-produced brochure which is available to our readers on request. It is particularly well produced and makes interesting and instructive reading, dealing as it does with an early and successful attempt at establishing a "planned" industrial centre.

Blackstone-Brush Diesel Engines

The directors of the Brush Electrical Engineering Company, Limited, Loughborough, and Blackstone & Company, Limited, of Stamford, announce that a working arrangement has been entered into between their respective companies regarding the Brush range of horizontally-opposed engines. The Brush range of Diesel engines will continue to be manufactured by the Brush Company and will be sold exclusively by Blackstone & Company as "Blackstone-Brush." These engines will be complementary to the Blackstone range, and Blackstone & Company will be in a position to supply Diesel engines from 3 h.p. to 2,000 h.p.

Notes from the Branches

Lincolnshire Section.—There was a meeting of the Lincolnshire Section of the Institute of British Foundrymen in Lincoln on February 13, Mr. G. L. Harbach presiding. The attendance was well up to average, and Mr. T. Makemson (Secretary of the Institute), who gave a short address, congratulated the Section on the progress it was making in spite of the conditions consequent upon the members being drawn from a wide area. New societies, including new Branches of the Institute, usually started amid considerable enthusiasm, said Mr. Makemson, but there came a dangerous period about the third or fourth year, when the enthusiasm had waned. In the case of the Lincoln Section, this third year coincided with the slump in trade, and the position for a time was discouraging. Due largely to the enthusiasm of a small number of members, the difficulties had been surmounted, the Section was now in a healthy condition, the attendances were good, and it was doing excellent work in keeping the foundrymen of the area in touch with modern progress.

Observing that members of the Section were taking an active part in the wider and national work of the Institute, the speaker said that the President (Mr. Harbach) and the Past-President (Mr. Dunleavy) were valuable and hard-working members of the Technical Committee, whilst the secretary (Mr. Walter) was active in the Institute's educational work, for which he was so well fitted by reason of his experience.

The Institute had recently agreed to a scheme of reorganisation which, it was expected, would be approved by the Privy Council during the present year, and it would probably come into force not later than the end of the year. The main feature of this scheme was the revision of the basis upon which members would be admitted to various classes of membership. The present system of classification, based upon the position which the member held, would be somewhat revised, and in future the major qualification would be the candidate's experience or his technical knowledge. Candidates would be required to possess certain stipulated qualifications, but the practical nature of the foundry trade was recognised, and very wide powers were given to admit candidates on the basis of practical experience, partly or wholly, in lieu of technical qualifications.

Mr. Makemson pointed out that it was a mistake to suppose that the operative had been overlooked; in fact, the operative would be in a better position than before, because he could join as an Associate by paying a very nominal subscription, and for about 8s. per year could purchase the "Proceedings" if he wished to. He could, therefore, have all the benefits of an Associate Member (except the right to call himself an Associate Member) at a much reduced fee, and he would not be required to give evidence of any special training or experience.

The new scheme would considerably enhance the value of membership to the individual, it would increase both his prestige and the prestige of the Institute. Mr. Makemson appealed to all members to give it their support, particularly during the awkward transitional period which would occur. Finally, he paid a tribute to the work of the secretary of the Section, Mr. E. R. Walter.

Two Papers were read during the evening by Mr. Smith and Mr. Morgan, of the British Thomson-Houston Company, Rugby, the former dealing with machine-moulding and the latter with the development of mechanisation in the ordinary foundry.

Mr. Thomas William Edwards, secretary and commercial manager of the Park Gate Iron & Steel Company, Limited, is to succeed Mr. Edgar J. Jenkins as president of the Rotherham Chamber of Commerce.

Institute of Metals

THIRTY-FIRST ANNUAL GENERAL MEETING

The Annual General Meeting of the Institute of Metals was held in London yesterday and continues to-day. The President, Dr. C. H. Desch, F.R.S., was in the chair. The Secretary presented the Report of Council for the past year, which pointed out that the outstanding event of the year has been the removal of the Headquarters of the Institute to No. 4, Grosvenor Gardens, which has made possible the scheme of further co-operation with the Iron and Steel Institute, from which much is expected. The Institute has been hampered in its work by the cramped accommodation of its former premises, and the larger space available in the fine building which it shares with the sister Institute will allow of much needed extensions of its activities. With the amalgamation of the two libraries, members have access to a fine collection of metallurgical literature, which may be studied in comfort, whilst the convenience of access will be greatly increased.

It had been hoped that the members and friends of the two Institutes would join in a visit to the United States and Canada, where our members and colleagues in those countries had taken immense pains to arrange a most attractive programme. The cancellation of the visit at very short notice, on account of the European crisis, was a great disappointment.

The work of the Local Sections has continued to grow in importance, and the practical nature of the Papers submitted and of the discussions which take place at the meetings is highly appreciated.

The total membership on December 31, of 2,252, is the highest on record; the previous record figure was 2,232, reached in 1931. The considerable growth in the number of student members in recent years—from 69 in 1935 to 168 in 1938—is a matter of special satisfaction to the Council.

Election of Officers

The Secretary announced the election of the following officers for the year 1939-1940:—

President: Dr. C. H. Desch, D.Sc., Ph.D., F.R.S.

Vice-Presidents: Lieutenant-General Sir Ronald Charles, K.C.B., C.M.G., D.S.O., Mr. Kenneth Gray and Lieutenant-Colonel J. H. M. Greenly, C.B.E., M.A.

Members of Council: Prof. Sir Harold Carpenter, F.R.S.; Dr. Maurice Cook, Ph.D., M.Sc.; Mr. W. C. Devereux, and Mr. A. J. Murphy, M.Sc. The election of 84 new members was reported.

Platinum Medal

The President presented the Institute of Metals platinum medal to its second recipient, Sir Harold Carpenter, F.R.S. The first award of the medal, which is offered annually for outstanding services to non-ferrous metallurgy, whether on the practical or scientific side, without restriction of nationality or membership of the Institute, was made in 1938 to Sir William Bragg, O.M., P.R.S. The medal, which was designed by Harold Stabler, and is of pure platinum, is the gift of the Mond Nickel Company. The design of the medal shows, on the obverse, the bust of a female figure who holds high a laurel wreath, and round the outside is inscribed "*Award of the Institute of Metals.*" The design on the reverse symbolises metallurgical research and consists of three intertwined links. In the top link "Research" is represented by a microscope, and the two lower ones represent the directions research may take—"Science," symbolised by a wash-bottle and filter, and "Industry" by a factory building. On the surrounding border is the inscription, "*For Distinguished Services to Non-ferrous Metallurgy.*"

Annual Dinner

The President, Dr. C. H. Desch, F.R.S., presided at the annual dinner of the Institute of Metals, held at Grosvenor House, Park Lane, W., last night. The principal guest was the Rt. Hon. Sir Kingsley Wood, M.P., Secretary of State for Air, who proposed the toast of "The Institute of Metals." Prof. J. H. Andrew, President of the Sheffield Branch of the Institute of British Foundrymen, proposed the toast of the guests, which was replied to by Lord Dudley and Dr. C. G. Darwin, M.C., F.R.S., the new director of the National Physical Laboratory. About 400 members and guests were present, including many foreign members.

The adjourned general meeting this morning, opened with a general discussion on "The Effect of Work on the Mechanical Properties of Non-Ferrous Metals."

This afternoon a session is to be devoted to a general discussion on "Industrial Application of Spectrography in the Non-Ferrous Metallurgical Industry."

Book Review

Metals. By Sir Harold Carpenter, M.A., A.R.S.M., Ph.D., D.Met., D.Sc., F.R.S., and J. M. Robertson, Ph.D., D.Sc, A.R.T.C. 2 vols. 1,485 pages. Published by the Oxford University Press, Amen House, Warwick Square, London, E.C.4. Price £5 5s. per set.

This extensive work is addressed to students of metallurgy or engineering and to those professionally interested in specific aspects of metallurgy. The first volume is divided into four parts and the second volume into two parts. Part I describes the characteristics of some of the more commonly used pure metals. Part II is devoted to a consideration of the solidification of metals and alloys and their structure and constitution, etc. Part III consists of two chapters dealing with the mechanical properties of metals and with oxidation and corrosion respectively. Part IV deals with the treatment of metals from the molten state to the finished product. The second volume, comprising parts V and VI, is devoted to a consideration of industrial alloys.

The first chapter serves as an adequate introduction to the study of metals in general, but in discussing factors affecting the selection of metals it is unkind on the part of the authors to specify nickel as an example of a metal whose more extensive application has been prevented by the high price maintained. It is far more desirable to utilise a metal whose price is being maintained at a steady and fair level than one whose price is liable to rise and fall suddenly as do the prices of some metals. It is, in fact, generally agreed that no metal producers have pursued a price policy more beneficial to users than have the nickel producers.

The theoretical side has been developed along the generally accepted orthodox lines, but in general lacks clarity of expression to such an extent that students will find the subject matter somewhat difficult to absorb.

Whilst some sections have been dealt with, if not in unnecessary detail, at any rate to such an extent as to become wearisome, several modern developments are dismissed in a few lines; for instance, very little attention has been devoted to isotopes, or to the anodising of aluminium alloys, or to the heat-treatment of magnetic alloys, or to sintering, all subjects of considerable theoretical interest and of great practical importance.

The general arrangement of the work leaves much to be desired. The chapter headings and sub-headings are far from helpful and the index also leaves so much to be desired that, as a book of reference, the work is practically useless because one finds bits and pieces of one and the same subject distributed throughout both volumes. As a case in point one may take heat-resisting steels and alloys. The results of creep tests are to be found in volume I, chapter 7. Resistance to scaling is considered to some extent in chapter 8 and to a further small extent in chapter 13. The nickel-chromium-iron system, in which practically all heat-resisting alloys fall, is dealt with in chapter 12, and the analyses of typical heat and acid-resisting alloys are equally widely distributed. Even when one has traced all the references to heat-resisting steels and alloys, it is impossible to discover what are the really desirable characteristics and what alloys to use for any given purpose.

The practical aspect of metallurgy is inadequately and somewhat inaccurately treated. As previously mentioned, anodising is dismissed in a few lines, and an equally small space is devoted to sintering of powdered metals, which is now an important development.

The section on magnetic steels is particularly misleading and inaccurate. Fig. 483 does not represent part of the hysteresis loop of a permanent-magnet alloy. It shows part of a hysteresis loop in which presumably the remanence and saturation values are equal, which, of course, is never the case. The lettering on the diagram is also incorrectly placed and, furthermore, it does not show a method of calculating BH max. but shows a geometrical construction for determining approximately the values of B and H which will give BH max.

It is difficult to understand why the authors should have thought fit to attribute Table No. 116 to Everest. It seems obvious that it is based upon this worker's results, but the authors have had added particulars of analysis which are not mentioned by Everest and have also thought fit to alter a very considerable proportion of the magnetic values that Everest gave. In an editorial letter subsequent to the publication of his article, Everest made certain corrections. It is not, however these alterations that the authors incorporated in the table. It is not obvious why they made any alterations at all and, in any event, the table as they give it is quite wrong.

A long chapter is devoted to casting. The authors deal with many aspects of the art, but fail to say what are the conditions necessary to produce sound castings or ingots. The suggestion, in Fig. 220, that crucible steel is made by melting wrought iron with carbon is incorrect. If one endeavours to make crucible steel that way, at least 75 per cent. of the crucibles will be "runners," and no two ingots will have the same carbon content.

The chapter on heat and mechanical treatment and related operations is elementary but in some ways amusing. Manufacturers of oil, gas and solid-fuel furnaces will, with justification, dispute the statement that electric furnaces give a more positive control of the distribution of heat than any of the fuel-fired types. It is amusing to read that in order to promote gripping, the indentations on the rolls between which a large ingot is first reduced are so very large that they have the appearance of cogs on a cogwheel and are hence known as cogging rolls. It is quite true that cogging rolls are roughened to a very considerable extent, but no one who has seen them would ever suggest that they look like cogwheels.

J. F. KAYSER.

FOUR HUNDRED MEN are now employed at the new I.C.I. engineering works at Landore, Swansea, which have reached the production stage.

East Midlands Foundrymen's Annual Dinner at Loughborough

The annual dinner and dance of the East Midlands Branch, Institute of British Foundrymen, held at the Bull's Head Hotel, Loughborough, on February 25, was greatly enjoyed by the 140 members and their guests.

At the high table the Branch President, Mr. R. Spriggs, was supported by the Mayor and Mayoress of Loughborough, Mr. C. W. Bigg (Past-President), Mr. S. H. Russell (Past-President), Mr. V. C. Faulkner (Past-President), Prof. C. H. Bulleid, O.B.E., M.A. (President, East Midlands Institution of Mechanical Engineers), Mr. T. Makemson (General Secretary), Mr. P. H. Wilson (Manager, Stanton Ironworks Company, Limited), Mr. R. H. Buckland and Mr. S. E. Dawson (Vice-Presidents of the Branch), Mr. H. Bunting, Mr. T. Goodwin, Mr. P. A. Russell, Mr. A. E. Peace (Past-Presidents of the Branch), Mr. B. Gale (Honorary Branch-Secretary), and Mr. G. L. Harbach (President, Lincoln Section) and their ladies.

The Institute

The loyal toast having been honoured, Prof. C. H. Bulleid, O.B.E., M.A., submitted "The Institute of British Foundrymen." In a humorous speech, he referred to his first contact with the foundry trade, during his apprenticeship at the old Midland Railway Works at Derby, under the late Mr. Harry Pemberton, a Past-Branch-President. He had found foundry work to be most fascinating and since maintained his interest in foundry practice. He therefore was particularly pleased of the opportunity of conveying a word of praise and encouragement to the Institute. It was the Institute, he said, which maintained the interest in the scientific aspect of castings manufacture, and also there was the support it gave to research and education. Nowadays, one saw mechanisation invading the foundry, but alongside that one would always see the craftsmanship of the moulder for the large castings.

Thirty Years Ago

Responding, MR. S. H. RUSSELL, Hon. Treasurer and Past-President, said when he was asked to respond to the toast, in the unfortunate absence of the President of the Institute, he was rather perplexed as to which line he should take. He had decided to look back for a number of years to the earlier Proceedings of the Institute. He attended his first Conference in 1908, when Mr. F. J. Cook was President, which was held at Birmingham during August Bank Holiday week. About 60 were present, including the late Mr. S. A. Gimson, the late Mr. H. Pemberton, Mr. V. Jobson, Mr. V. C. Faulkner and Mr. H. Winterton. The membership at that time was 448, and the total revenue £138. The report of the Council read almost similar to that of last year.

"During the past year the Council have seriously considered the position of the Association, and as a result call attention to the following suggestions:—

"The Association was established purely on an educational basis. Conducted solely on these lines, the results up to date have been extremely successful. However, the time has now arrived to consider whether greater success is not within their reach. The Council consider that an opportunity is now presented of widening the organisation by attaining greater facilities and in turn greater efficiency. Given these facilities, the printed proceedings could be enlarged in the following directions:—(*a*) Fuller reports of the discussions at annual meetings; (*b*) the inclusion of Papers read at Branch meetings; (*c*) discussions at Branch meetings; and (*d*) abstracts of British, Continental and American Papers or researches relating to foundry practice. These ideals cannot be attained without funds, and, as an illustration, the Council state that the present cost per member is 7s. 9½d. per year."

This report, Mr. Russell said, indicated how history repeated itself. There were only three Branches at that time—Birmingham, Manchester and Sheffield.

In May, 1910, Mr. H. Pemberton gave a very interesting Paper on Cylinder Moulding to the Birmingham Branch.

In June, 1913, Mr. Matt Riddell, of Glasgow, supported by the Sheffield Branch, obtained direct representation of the Branches on the Council.

In May, 1914, the Annual Conference was held at Leicester, 120 members attending out of a total of 974, the revenue being £470. At that time there were seven Branches, and that conference was responsible for the commencement of the East Midlands Branch. Since then the membership of the Institute had become increasingly important and valuable both to the Industry and the individual member. The work and strength of the Branches was still the outstanding feature of the Institute and was envied and had been imitated by different societies and kindred institutions.

They were anxious to develop the work of the Institute and were now in a position to publish several of the reports of the Technical Committees. This year the International Congress was to take place in London, and a post congress tour of the provinces. Mr. Russell, in conclusion, thanked Prof. Bulleid for his sympathetic references to the educational work the Institute was doing.

Local Activities Praised

Mr. T. Makemson, General Secretary, proposed the toast of the East Midlands Branch, coupled with the name of its President, Mr. R. Spriggs. During his wanderings, he said, round the territory covered by the Institute he had found during conversation with the members of different Branches that there were at least six Branches, each one of which was the very best. He had sometimes been asked to endorse that opinion, but with what he hoped was tact, had contented himself by saying "Yes, it is a good Branch." One could say that with all sincerity, as all the Branches were good Branches, but of course, they varied. The outstanding feature of the East Midlands, he said, was the outstanding friendliness which existed between the members of the Branch, whether they be managing directors of foundries or operatives, which had contributed materially to the work of the Branch and the Institute in general. The Branch had supplied the Institute with three Presidents, and the two surviving Past-Presidents were still very active. Other Branch members had played an outstanding part in the Institute's progress. The Branch had supplied two Technical Committee Convenors. It had also had two recipients of the Oliver Stubbs Medal, and another had been awarded the Meritorious Service Medal. Mentioning the secretarial work of the Branch Mr. Makemson said it had been well served. Its first secretary was Mr. S. H. Russell, and then for 20 years Mr. Bunting had carried on the work. He paid tribute to Mr. Gale, Mr. Bunting's successor, for the way in which he was continuing the work. The toast, he said, was coupled with the name of Mr. Spriggs, who, had been connected with the industry for many years. During the past few years he had been of considerable benefit to the Branch, and had worked through the offices of Junior and Senior Vice-President, and was now about to complete a year as President. Membership of a technical organisation was essential to those desirous of making progress, which was a very right and proper reason for a man to be a member. Many members of the Institute looked upon it as a major activity in their life's work. Not only was the work done by the central committees, but by the member who attended his Branch meetings month by month. He would like to say to all members that their support of the Institute was appreciated, and on behalf of their fellow members would also add "thank you" for all they were doing and trying to do. They respected the work of the Branch, and that was why they were going to drink with the greatest of pleasure to the long life and prosperity of the East Midlands Branch.

Responding, MR. R. SPRIGGS, said that he had found that when one got really interested in one's job, it was nearly at an end, but he did hope when he got to the end of the job, that he would not sink back entirely into oblivion. He was delighted with the way in which they had all attended and supported him in such a grand manner.

There was a large amount of work to be done in connection with the coming International Congress, and their future President Mr. R. H. Buckland, would be given all the help possible. He expressed his thanks to Mr. Makemson for the kind words said of the Branch, and himself, and thanked everyone for their support that night.

The Guests

Submitting "The Guests," MR. R. H. BUCKLAND extended to them a very hearty welcome. The East Midlands Branch had always been favoured with a number of distinguished guests and that night was no exception. They were very pleased to see the Mayor of Loughborough. Loughborough had always been the centre of the East Midlands Branch, and he was sure the Branch were indebted to Loughborough and its Engineering College, which had done much towards the progress of the Branch.

They had all heard Prof. Bulleid propose the Institute, and they were very pleased to see that he had recovered from his recent illness sufficiently for him to be present that evening. They had with them their hard-working General Secretary, Mr. Makemson, who still managed his 100 per cent. attendance at the Branch Dinner. He was considered to be "one of them" and hoped he would continue to attend for many years to come. They were disappointed that Mr. E. J. Fox had been unable to be present, but were very pleased to welcome Mr. Wilson, who was representing the Stanton Company.

Another guest they were always glad to see was Mr. V. C. Faulkner, Past-President of the Institute, and Editor of THE FOUNDRY TRADE JOURNAL, the Institute's official organ. He was sure that some of the Institute's success could be attributed to Mr. Faulkner. Mr. Faulkner had mentioned to him that evening that it would be of interest to all present that in connection with the coming World Congress, the Government had decided to give a Reception on the Tuesday evening.

Lastly but not least, he said they had the ladies with them for the second year in succession and he was quite sure the gentlemen would agree they had brought brightness and gaiety to the function.

HIS WORSHIP THE MAYOR OF LOUGHBOROUGH (Coun. G. H. Dean, J.P.) thanked the Branch for their hospitality and said how very pleased he was to be able to accept the invitation. He appreciated their visiting Loughborough, and also expressed his congratulations to the Branch on their selection of Mr. Spriggs as President, who had done so much in the cause of local charities.

Some Jobbing Problems*

By F. G. JACKSON

Hydraulic Cylinders and Rams

One of the first problems associated with hydraulic castings is to decide how the cylinder or ram is to be cast—on the flat, banked or vertically. Many cylinders are, of course, cast on the flat or banked, but they are generally of small size. This enables them to be run sharply, and they can be cast without the use of chaplets to hold down the core. Large cylinders made on the flat or banked would require the core to be held down in one or more places, but this is not the only objection. A heavy hydraulic cylinder is a bulky casting which is never poured at white heat, and, therefore, it must take a reasonably long time to pour.

Fig. 1.—Showing Shrinkage Cavities due to Faulty Feeding.

Metal climbing slowly up a wall between mould and core must not only be oxidising rapidly, but at the same time must be enclosing gases generated from the mould and core. The combination of these actions results in a seam of drossy metal along the top of the casting, which will probably sweat badly under pressure. A cylinder cast on a steep bank will not show these defects to the same extent. Cylinders cast horizontally are known to have opened along the top centre under water pressure. While such an occurrence is unusual, there is no doubt that this method of casting leaves something to be desired.

Hydraulic work, so far as cylinders and rams

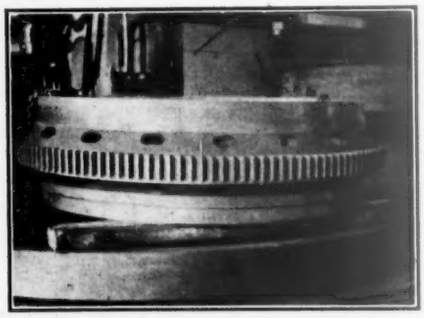


Fig. 2.—A Casting Liable to Give Trouble at Junctions of Thin and Thick Sections.

are concerned, can be divided into two classes—types which can be machine-moulded and types which cannot. It would hardly pay to put a cylinder with trunnions and several diameters on a machine, even if boxes were available.

The most economical way of moulding is horizontally, but the best way of casting is vertically. In the production of this class of work, there are seven main essentials:—(1) Good and well rammed; (2) good loam for the cores, with straw rope correctly wound; (3) proper design of cylinder or ram; (4) correct positioning of runners; (5) anchoring the cores; (6) feeder heads; and (7) correct type of metal and casting temperatures.

The author will deal briefly with each of these factors in turn.

(1) A good loam sand is advisable on the bottom of the cylinder, reaching up for a distance of 3 to 4 ft.

(2) A good-quality loam, made of sharp sand (free from lime), ball clay and manure. The loam should be crisp, hard and open. The rope should never be wound tightly in one winding. The best method is to wind with a gap between the coils and tie up. Loam should be daubed on the rope and barrel and another rope pressed down between the coils of the first rope. This gives a bridging effect, causing each rope to be entirely covered by loam. A half-inch coat of loam should be applied and the core dried. The barrel should always be of the largest possible diameter; a small core bar with wind after wind of straw rope is not good practice. On the last coil a double ½-in. coating of loam is required. On very long heavy cylinders, a few irons 2½ ft. long, placed 3 in. apart at the bottom of the cylinder, and wired in position, on the last layer of loam previous to the finishing coat, will be effective in preventing any swelling or distortion of the core. On this type of cylinder only ⅜ in. clearance is given between ram and cylinder wall. Any scab or swell has to be machined off. This means on a cylinder of this length a very long boring bar, involving both a costly and tedious job.

(3) Good design, meaning uniformity of section, without too many heavy pads and ribs, all of which mitigate against the production of good work.

(4) The runners should always be nearer the mould than the core, and the mould should be absolutely perpendicular, so that runners will not foul the core or mould. Incidentally, when considering runners, it is as well to err on the right side, keeping the runner choked off and releasing the chokes if metal is on the dull side. Prints can always be juggled with to allow the runners to be filled out of the core prints. This is always the cheapest and cleanest method.

(5) Cores may be anchored with the least amount of trouble and the maximum safety by having a screwed journal and a lock nut above and below the bottom bar of the box.

(6) Many text-books indicate how much head is required on hydraulic cylinders; but experience of this work teaches far more than books, and it always pays to be generous with heads. The practical man knows that headers perform three main functions—cleaning, inducing pressure, and lifting up the shrinkage patches.

(7) Immense latitude can be allowed with regard to metal. Many years ago the old type of foundryman used to swear by hematite. If a casting was in any way different or intricate, hematite was used. The author has always made it a point to avoid hematites when making pressure work unless part of the charge is steel, when, of course, the hematite with its 4.0 per cent. carbon loses its identity as hematite and becomes low-carbon iron. Low-carbon iron with its close structure is ideal for pressure work.

Personal experience has indicated that the best casting temperature for cylinders is about 1,220 to 1,240 deg. C. and for rams 1,250 to 1,280 deg. C. Rams can be produced quite clean and free from gas holes at this temperature.

Sometimes lack of head room and crane power causes difficulty in upending cylinder and ram moulds and boxes. On a long cylinder, if four chains are used and the bottom handles are slung at the top, and the top handles at the bottom, the box will pick up at 45 degrees and can be laid on a bank in the pit and turned up quite easily. When turned up, the box should be well propped, or it may collapse during casting.

Shrinkage, Porosity and Segregation

The graphitising effect of silicon in cast iron is well known. Present in normal amounts in ordinary irons, it exercises a coarsening effect on the carbon structure, and at the same time assists in throwing out of solution varying

Fig. 3.—Showing the Variation in Section Thickness of the Casting shown in Fig. 2.

amounts of carbon which would, if the silicon was lowered, be more in the combined form. In a low-carbon iron of 2.6 to 2.7 T.C, two per cent. silicon would impart good machining qualities to the iron, which would probably be unmachinable if only 1.0 per cent. was used.

Phosphorus, too, is to some extent a graphitiser. It exists in iron in a very different state from the silicon. While silicon becomes part of the ferritic structure, phosphorus forms a

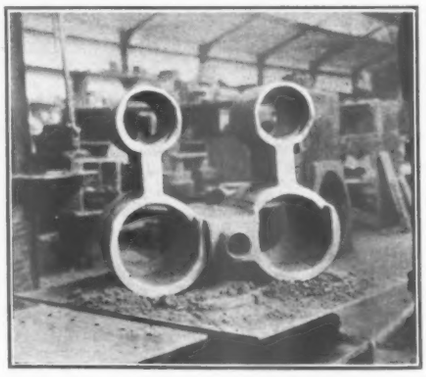


Fig. 4.—Twin-Steam Jacketed Hydraulic Brake Cylinder.

separate network around the crystal structure. Its low melting point causes the metal to remain in the fluid state for a much longer period, if it is present in fairly large percentages. It remains fluid after the iron has frozen, and sometimes feeds down from higher to lower sections and causes tears in some castings, especially in the bores. The fact that it prolongs

* Paper read before the Wales and Monmouth Branch of the Institute of British Foundrymen.

fluid life will in itself bring about a coarser structure.

On precipitation, a certain expansion takes place which helps to prevent shrinkage cavities, but which at the same time produces an open-grained metal. In low-carbon, low-phosphorus irons, quick cooling takes place and segregation, porosity and internal shrinkage are rarely seen.

External shrinkage in the form of piping is more in evidence, and this can generally be overcome by large risers or feeder heads. If a

Fig. 5.—Showing the Denseners Used for Making the Casting illustrated in Fig. 4.

fairly large daily tonnage of low-carbon iron has to be melted, shrinkage and segregation troubles can be avoided. Otherwise trouble can be expected. Even so, it is mostly with badly designed castings that these troubles become apparent. It can be truthfully said that if a casting could be poured hot and every part of the casting could be cooled quickly and at the same time, a perfect casting would result, but that casting has yet to be made.

In black castings, the trouble will be present, but will not be discovered until the casting is broken up. Fig. 1 shows such a case where shrinkage cavities and precipitation are evident, probably due to the fact that these particular parts were the last to freeze and could not be fed from above, they themselves having fed the part of the casting below.

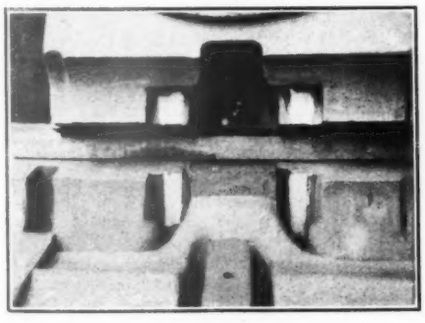
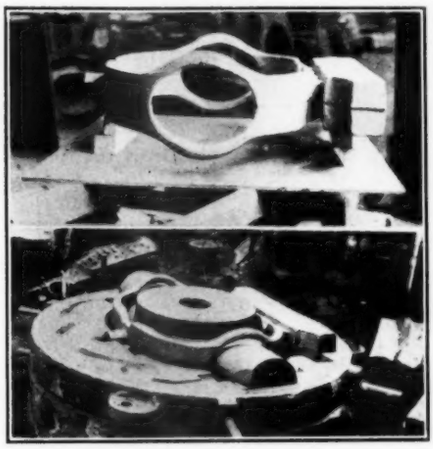


Fig. 9.—Method of Applying Denseners in the Casting shown in Fig. 8.

Trouble due to the junction of thick and thin sections on the wheel shown in Fig. 2 was overcome by employing low-carbon irons, casting hot and using substantial risers for feeding. It will probably be noticed by the practical man that this casting is rather a difficult one to run in a satisfactory manner. It can only be run from the bottom, and this causes the dullest metal to be in the top. This, with low-carbon irons, tends to produce gas holes if cast at too low a temperature. The gases are trapped under the rapidly-freezing upper surface and the casting when machined discloses the holes under the top skin. Hence there is the necessity of casting at not less than 1,300 deg. C. It will be appreciated that, when a casting is machined, the denser metal is removed and the deeper one cuts the more open becomes the structure. In this case, in order not to leave a facing which will entrap dirt, the casting is made with a thick



Figs. 6 and 7.—Method of Densening Rotary Pump Castings.

straight section. Fig. 3 illustrates the varying sections, whilst Fig. 2 shows how much metal is cut away. In this type of casting there is a general sort of trouble, but one which can be overcome by good iron and good feeding.

What of smaller castings in everyday work, which give local porosity or segregation? Many large castings give local troubles, but in most cases it is due to lack of uniformity in section thickness, in other cases due to the junction of

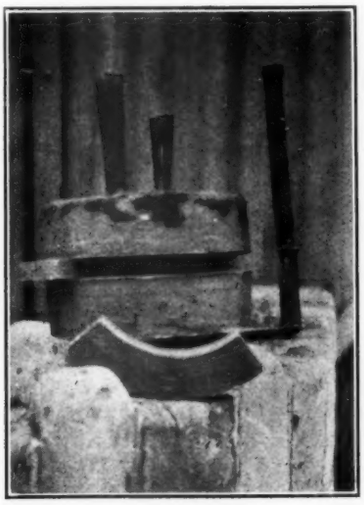


Fig. 10.—A Cone Casting Liable to Cause Troubles.

many sections, and in some castings fundamentally bad design. In the last category enter spur wheel blanks having very heavy rims and bosses and spidery arms. The foundryman has to consider the thinnest section—the arms—when he is deciding the type of iron to use. He will probably use an iron in the hematite class, which will give softness, elasticity and toughness, but is this metal suitable for the rim, when heavy teeth have to be cut? He is bound to get an open-grained metal. Such a case calls for alteration of design if possible.

Hydraulic Brake Cylinders

With regard to problems where design cannot be altered and where the troubles are local, much good work can be done by external densening. In the first place, it is necessary to appreciate one inevitable action in a casting in which thick and thin sections join, or a number of sections meet. The thin sections, freezing first, draw metal from the still liquid thick sections and thus feed themselves. If the design be such that a feeding rod cannot be

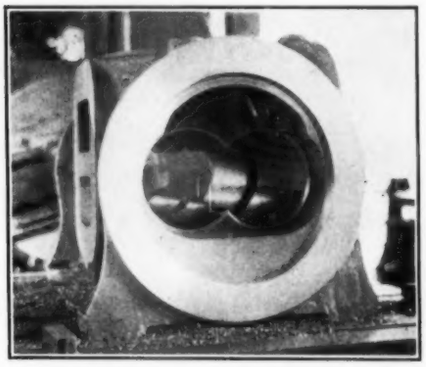


Fig. 8.—Screw Pump Casting.

applied, shrinkage ensues. The denseners have, therefore, the action of equalising the freezing times of thick and thin sections. Fig. 4 shows a twin steam-jacketed, hydraulic-brake cylinder. The casting thickness is $\frac{5}{8}$ in. round the bores and $\frac{5}{8}$ in. round the steam jacket, whilst under and over the ports there is 3 in. of metal. There are many heavy pads on the cylinder, which aggravate the trouble.

In the first place, it is necessary to get the gases away from the jacket and four ports as quickly as possible, and to facilitate this, the job has to be cast slowly. Casting slowly will produce bad leakage around the studs, if low carbon iron be used. Therefore, one must use an iron of greater fluidity, obtained by increasing the carbon and silicon, for increasing the phosphorus is objectionable. While the mixture is quite good around the bores and jacket, it is open grained above and below the port cores. Using feeding heads caused the open grain to be more pronounced; therefore, every heavy

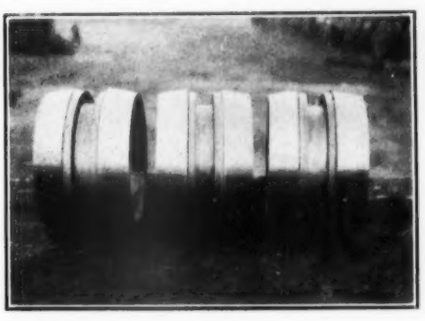


Fig. 11.—Finished Cone Castings showing Grooves.

section was densened, including the tops and bottoms of all four bores, and additionally a small densener was used on each of the heavy lugs, as is shown in Fig. 5.

Rotary and Screw Pump Castings

In a simple steam-jacketed rotary pump, the thin jacket joins the heavy bore, and porosity

results at the junction. A densener placed on the top surface of the bore, where the jacket joins one of the ports (Figs. 6 and 7), equalises freezing rates and produces a sound casting.

Fig. 8 shows an example of a screw pump in which a number of sections meet behind the valve face. In the centre of the valve face is a thick bar of metal, which aggravates the trouble. Only in this one section, underneath the valve face, does any trouble arise, and Fig. 9 shows how and where the denseners were applied.

Fig. 10 shows a cone capable of giving rise to much trouble. In this instance the cone pattern was solid, and when the groove was cut, porous metal was revealed. Even when cast with cores, this cone is not too satisfactory, because of the heavy body of metal in the interior. Iron cores were used on this casting and gave really splendid results. The hard bright groove is easily seen in Fig. 11.

Fig. 12.—Light Castings which are Capable of Causing Trouble in the Foundry.

Sometimes, in pressure work, small intricate castings can give rise to trouble, and Fig. 12 is a typical case where the junction of many sections again resulted in a porous patch and trouble was experienced in the fitting shop. The use of an iron core cured the leaking.

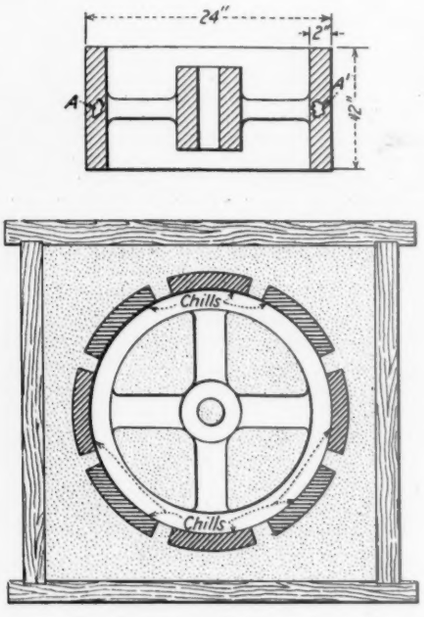


Fig. 13.—Losses from Shrink Holes in Gear Castings can be Greatly Reduced by the Use of Chills, as shown in the lower drawing.

It is not suggested that densening is a cure for all foundry ills. Neither is it a simple matter of applying a piece of iron to a casting and producing a satisfactory result. A definite technique has to be developed. On dry-sand work, the densener can be rammed in position. When it comes out of the stove it will probably be rusty. Thus it is necessary to clean off the rust, and coat the surface with oil and blacking.

For use in green-sand work prints should be used, with denseners of definite shape. The denseners should be dried, coated and put in the mould and cast as soon as possible, that is before moisture condenses on the densener. Probably the most important point of all is not to run the casting directly on the densener, or a burning on action will take place.

This densening process can be applied to the bottoms of heavy bosses, on brake wheels, couplings, pump covers and a large number of other

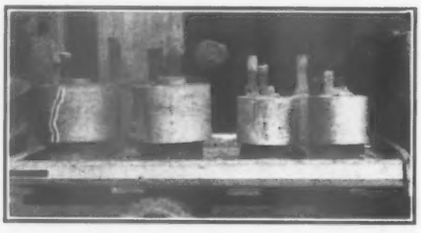


Fig. 14.—Small Brake Chill Castings.

castings. Prolonged feeding times can be saved and the foreman need not rely on feeding to the same extent. That the value of densening is appreciated in America is shown by Fig. 13, taken from "The Foundry." It shows a wheel which has been heavily densened on the rim to counteract shrinkage and porosity. If the methods are justified by results, which are the main object, why not indulge in them? After all, the founder is only taking advantage of elements in the iron which lend themselves so readily in densening, and is not production from densened moulds similar to chilled work? The only difference is in the iron itself.

Small Rolls

Reference to chilling brings up another problem to the foundryman. To the experienced chilled-roll founder, with air furnaces at his disposal, the ordinary little rolls would be treated

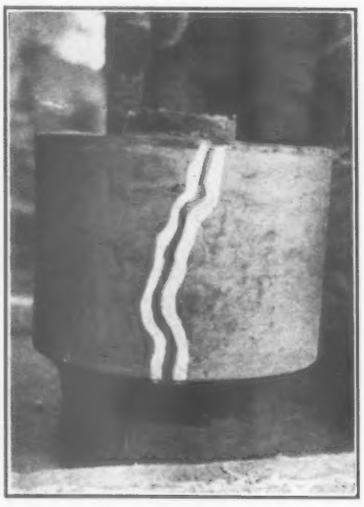


Fig. 15.—Showing a Cracked Casting Difficult to Diagnose.

with contempt. In the small foundry, and with cupola-melted metal, much trouble can be encountered with these small rolls, especially when they have to be cast together with everyday work. Before and behind the chill iron charges are irons of entirely different structure, and extreme precautions have to be taken to ensure the correct tapping of the charges. One difficulty with the brake chills is that the inside has to be perfectly machinable, and the outside, of course, must be diamond-hard.

During one cast, illustrated in Fig. 14, a peculiar result was achieved which could not be understood at the time. The four chills were poured from the same ladle of metal. The first, third and fourth were sound, but the second shown in Fig. 15 cracked. Chilled-roll makers would probably have known instantly the cause. It was afterwards found that the chill block was very much hotter in the case of the cracked chill, due to the fact that it had been loaded in a higher position in the stove. This was tried again later, and the same cracked casting resulted. This, it was reasoned, was due to the fact that the hot chill block would remain in contact with the casting for a much longer period and a more severe chilling action would result. On the other hand, the cooler blocks would expand away from the casting much earlier, and give a less deep chill but a sound casting.

(To be continued.)

Patent Specifications Accepted

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each. The numbers given are those under which the Specifications will be printed and abridged, and all subsequent proceedings will be taken.

494,943-4. Shorter, A. E., and Shorter Process Company, Limited. Machines for surface-hardening metal articles.

494,947. Staatl. Sachsische Hutten- und Blaufarbenwerke. Decomposition of ores containing tungsten and the like metals.

494,965. Tate, F. R. (Beardsley & Piper Company). Method of and apparatus for treating moulding sand.

495,041. Wagenbach, A. Device for use in shearing machines for bar iron and for similar tools operated by a hand lever.

495,079. Deutsche Rohrenwerke Akt.-Ges. Rolling mills for rolling hollow bodies such as tubes.

496,084. Renette Company. Methods of casting pistons.

496,151. Tama, M. Method and apparatus for the continuous casting of metal pipes or tubes.

496,289. Brassert & Company, Limited, H. A., Brassert, H. A., and Fraser, J. S. Refractory linings for shaft furnaces.

496,537. Birco Motor Cylinder Company, Limited, and Howell, J. P. Method of and means for casting engine and like cylinders.

496,542. Williams, W. P. (American Rolling Mill Company). Direct casting of sheet-like metal structures.

496,774. Horsburgh, G. D. L., Tetley, F. W., and Swift, Levick, & Sons, Limited. Permanent magnets and alloys therefor.

496,848. Craven Bros. (Manchester), Limited, and Longden, E. Stoves or furnaces for drying foundry moulds and cores.

495,190. American Chemical Paint Company. Electrolytic method of coating surfaces of iron or steel.

495,232. Madison-Kipp Corporation. Die-casting machines.

495,475. Young, H. J. Production of grey cast iron.

495,668. General Electric Company, Limited, and Price, G. H. S. Magnetic alloys containing tungsten.

495,678. Vereinigte Edelstahl Akt.-Ges. Hard metal alloy.

495,725. Baker & Company, Inc. Compositions for moulds for casting metal or other materials.

495,819. Young, H. J. Production of grey cast iron.

495,820. Young, H. J. Machineable grey iron castings.

497,070. British Cast Iron Research Association and Buchanan, W. T. Manufacture of cast iron.

497,099. Bower, W. G., and Cleworth & Company, Limited, A. B. Furnace roofs, arches, and the like.

Davy and United Roll Foundry, Limited

REORGANISATION AND EXTENSION OF WORKS

(*Continued from page* 195.)

EFCO-Heroult Electric Furnace

For many years the small Héroult furnace which had been in operation, had enabled the company to develop an important connection in steel castings of up to between 2 and 3 tons; but it was realised that additional melting capacity was essential if the requirements of the parent company were to be met, apart also from a rapidly-developing market for steel rolls.

The rival claims of the open-hearth furnace as compared with the electric furnace were thoroughly investigated, and, in view of the remarkable results the company had already obtained from alloy steel rolls and from all available data, the conclusion was drawn that for rolls of exceptional strength and wearing quality, the electric furnace stood supreme. It was decided, therefore, to install the most modern electric furnace possible having a maximum capacity of 18 to 20 tons. The 5-ton weighbridge mentioned earlier in this article is used to control the weight of the various classes of scrap and alloy being charged into the furnace. In the vicinity there is a concrete former for the building of furnace roofs. A spare roof will always be carried on this former ready for use.

The furnace is installed in the new steel building, and is equipped with a Parsons' transformer of 3,000-k.v.a. capacity. Current is supplied at 11,000 volts, brought to a switch house at the extreme north-east corner of the works site. Here are installed the North-Eastern Electric Supply Company's switchgear and a Crompton-Parkinson switch feeding the new 14-ton furnace. This switch is arranged for remote electrical operation from the furnace control room. In the transformer house are situated the pumps, accumulators and suction tanks, which actuate the hydraulic roof-lifting, tilting and electrode-control apparatus of the furnace. The instruments for all these controls are assembled on two neat instrument boards in a control room, forming a part of the transformer house, the furnace being clearly visible to the operator when at the controls.

The furnace is a three-phase arc furnace, of 10 to 14 tons nominal capacity, of the removable-roof type, supplied by the Electric Furnace Company, Limited, of 17, Victoria Street, London, S.W.1. Roof-raising, furnace-tilting and electrode control are all hydraulically operated. This type was selected because of the following advantages:—(1) The removable roof enables the furnace to be charged in a single operation by a charging basket of the requisite capacity, thus considerably reducing the idle time of the furnace. (2) Roof-raising is carried out by means of a hydraulic cylinder attached to the side of the furnace. This reduces the cost of foundations. (3) The roof is actually supported at three points on a lifting arm, thus permitting expansion and a certain amount of distortion. One point nearest to the cylinder is lifted first so that a lever action is obtained, which considerably assists the lifting operation if the roof has stuck. (4) Roof-raising and tilting operations are each controlled by a hydraulic valve, giving smooth control from standstill to maximum speed. (5) The electrode control, being hydraulically operated, is dynamic as opposed to static. If the electrodes are electrically controlled, the operating motor has to accelerate from standstill to full speed for each movement of the electrode which takes place. (6) The door-arch, electrode holders and coolers are all water-cooled from the town's water supply, but provision has been made for conversion to a closed cooling system, if required at a later date.

The electrode control is of the Armas EFCO type, which has been installed on a very large number of furnaces, both in this country and abroad. Provision is made on the control panel for hand or automatic control, and also regulators are provided so that under automatic working the load can be held at any predetermined figure from one-fifth up to the full load of 3,000 k.v.a. The operating fluid is water, with a percentage of soluble oil, fed from an air-loaded accumulator supplied from a small rotary pump.

A second rotary pump of the Mirrlees-Imo type supplies the pressure for the roof-raising and tilting operations. These pumps, with the accumulator and a combined suction tank, are

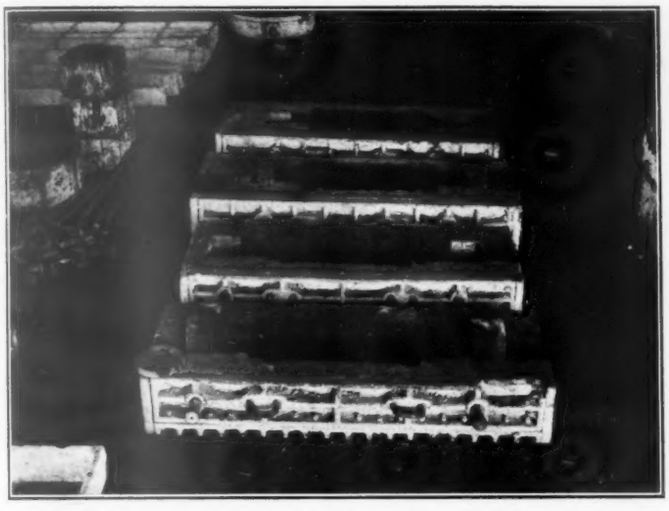


Fig. 9.—Showing Moulds for Section Rolls in Roll Foundry.

Fig. 10.—Group of Plate Rolls in Foundry.

Fig. 11.—New Machine Shop looking North.

installed in a pump room adjoining the transformer house.

The hydraulic control panel is mounted in the control room adjoining the high-tension control panel, from which point the main circuit-breaker in the switch house is controlled, and also the motor-operated tap-changing equipment in the transformer. This panel also carries the various electrical measuring instruments.

Fig. 12.—Machine Shop looking South.

Heat-Treatment Furnace

Most modern high-duty rolls require extremely elaborate and accurately controlled heat-treatment, and the firm decided that if they were to obtain the maximum benefit from their alliance with the United Engineering & Foundry Company of Pittsburgh, who were able to provide expert advice on the composition for steelworks rolls and the most suitable form of heat-treatment, their manufactures must henceforth include special steel-base rolls requiring complex treatment.

The most easily controlled fuel for this purpose is town's gas, but it was found that the local supplies were much too expensive and that even though a better price might be negotiated, the quantity was insufficient. It was decided, therefore, to employ pulverised coal, and a design was finally worked out by the consultants, in collaboration with the Standard Pulverised Fuel Company, Limited, and the Dowson & Mason Gas Plant Company, Limited, which latter firm was entrusted with the construction of the furnace itself. The design provides for a large combustion chamber, separate from the furnace proper, and located below the furnace hearth. In this combustion chamber the pulverised fuel is completely burnt and the hot products of combustion emerge through a large number of ports at each side of the furnace hearth. The furnace, which accommodates rolls up to 40 tons weight, is charged like a soaking pit by removing the roof in three sections. In order to facilitate the charging and discharging of the furnace, the whole unit is built about 8 ft. into the ground, so that the roof seals shall not be more than 5 ft. above foundry floor level. The approximate inside measurements of the furnace are 20 ft. by 8 ft. 6 in. by 5 ft. deep.

It was necessary, in this case, as with the electric melting furnace, to take special precautions against ingress of water into the foundations. The foundations, therefore, consist of a reinforced-concrete pit, specially waterproofed, and the furnace brickwork is itself contained in a welded steel tank, grouted inside the foundation pit. Insulating bricks are freely used so as to ensure the very highest efficiency of combustion. The burners are fed by steel pipes connected to the 130-ton fuel bunker, which serves the large air furnace. The burner-gear controls have been supplied by the Standard Pulverised Fuel Company, Limited.

Pyrometric Control Gear

In addition, an elaborate system of automatic pyrometric-control gear is installed so that a predetermined programme, covering a period of as much as ten days, can be presented to the furnace, which will thereafter carry it out without human intervention, and will leave a permanent record that it has done so. This work was entrusted to the Bristol Instrument Company, Limited, of Hendon, and the programme for any desired cycle of heating, holding and cooling, is controlled by a thin metal cam, which operates by means of pneumatic relays. Sheet-metal discs are provided in an aluminium alloy, printed on the surface with the conventional recording pyrometer markings. With these markings as a guide, it is a simple matter to draw, in pencil, the heating and cooling cycle, and then to cut the disc to the pencil outline, thus forming the cam. The cams, after use, can be stored very simply like gramophone records, with the particulars of the order or the roll inscribed upon them, and it is, therefore, an easy matter to duplicate for any customer the exact heat-treatment which has been found to produce the most efficient roll.

Sand-Reconditioning

A new sand plant, by August, Limited, of Halifax, was installed in the eastern bay of the old foundry building, midway in its length. In this, tramp iron, sprigs, etc., are magnetically separated from the used sand, which is then desilted and mixed with new sand. It is then elevated into a hopper underneath which can be run special steel skips or stillages for distributing the sand to the points of demand.

Heavy loads, such as roll castings, ladles of liquid steel, etc., are moved from bay to bay on special flat-topped bogies on Skefko bearings. Light loads, such as sand from the August plant, patterns, alloys, etc., are moved in stillages carried by Lister trucks.

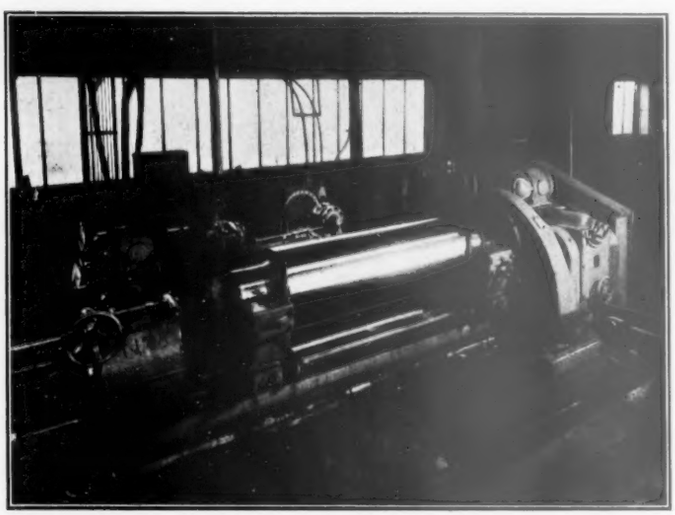


Fig. 13.—Waldrich Grinder, with 34 in. by 8 ft. Plate Roll.

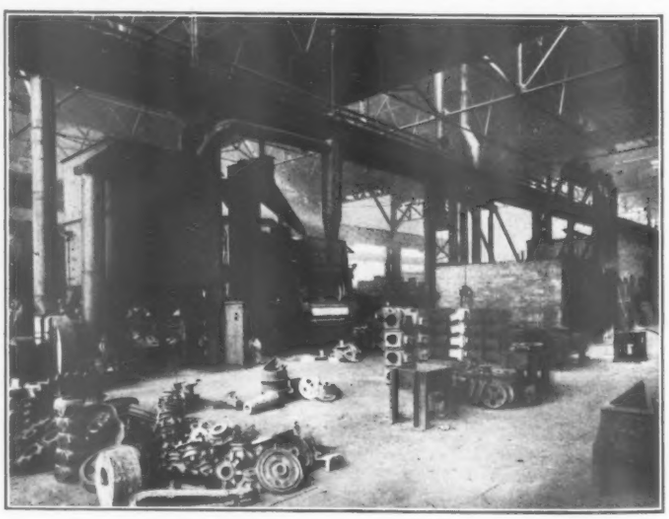


Fig. 14.—Wheelabrator and Core Stove.

Mould-Drying Stove

For the general foundry work outside of the linseed-oil sand process, considerable additions

to the mould-drying stove capacity were made. There were in existence in the old foundry, three large stoves which were hand-fired with coke but were not very efficient. These have, therefore, been first tackled by adding to them a modern combustion chamber supplied by Pneulec, Limited, Birmingham, with the object of reducing the fuel consumption, and of increasing the volume of hot air passing through the stoves. Three other large mould-drying stoves have been added to the equipment, two by Pneulec, Limited, and one by the Foundry & Engineering Company, Limited, of Birmingham. These are in addition to the two stoves for the linseed-oil sand process. On two of these large stoves there have been incorporated Mirrlees automatic stokers. These stokers have now been running for some months, and have already proved that the automatic control can be relied upon to keep the temperature of the stove at any desired level, without attention. This is extremely useful when large moulds have to be dried every night.

Linseed-Oil and Moulding

In addition to the ordinary methods of moulding in boxes, which are provided for by the existing equipment, and the additions above-mentioned, it was decided for some quantity-production castings to extend the use of the more modern method of oil-sand moulding. The whole of this special process was concentrated in the small bay on the west side of the foundry extensions, so keeping this process and this type of sand entirely separate from the other parts of the foundry.

The plant consists of a sand-drying equipment, placed outside and alongside the railway line, a mixing mill placed just inside the building, a moulding machine with run-out tables and two drying stoves. The sand-drying plant was constructed by Pittevil & Co., and consists of a vertical drying drum, located above a coke-fired furnace, constructed in brickwork. The sand is elevated into the top of this drying drum from a boot close to the railway line, at such a level that the sand can be freely discharged from the wagons into the boot. When the sand enters the top of the drum, it passes downwards against the rising current of hot air, over a series of shelves, and is moved from shelf to shelf by rotating paddle arms at each successive level, all mounted on a common spindle vertically disposed in the centre of the drum. The paddle, spindle and the sand elevator are driven by one motor. The sand emerges from a spout at the bottom of the drum, passes over a screen which removes any large stones and gravel from it, and drops into a long inclined pipe, supplied with a strong current of air, from a fan. The sand is thus elevated into a cyclone, which separates out the fine dust and discharges this to atmosphere and allows the solid particles to fall into a storage hopper of large capacity. From this hopper, the sand falls by gravity on to a rubber conveyor belt, which takes it to the mixing mill just inside the building. The mixing mill, also of Pittevil manufacture, is supplied with measured quantities of linseed oil and molasses, so as to give a constant percentage addition to the dry sand. As each batch is mixed, it is discharged through a hopper slide in the bottom of the pan on to the foundry floor, which is made of cast-iron plates. The moulding machine is a Hermann pneumatic machine, supplied by Pneulec, Limited, and is placed close alongside the mixing mill. With this process of moulding, no boxes are required beyond the master box, which stays upon the moulding machine and forms, virtually, part of the pattern.

As each mould is made, it is sufficiently robust to be extruded from the moulding box, traversed along a roller path, from whence it is elevated on to a special stillage having half-a-dozen shelves disposed one above another. As each stillage is filled with the green moulds, it is jacked up on a small four-wheel trolley and transferred into one or other of two drying stoves. Each batch is stoved for from two to three hours, depending upon the size of the mould. The resulting moulds, after stoving, are extremely robust, and can be quite freely handled without risk of damage. The sand, after casting, is not recovered, and it is essential, therefore, for this process, that there should be a supply of cheap sea sand available. This particular foundry is very well situated close to the Durham coast, to make use of this process.

Annealing Furnace

In the old works, the steel casting capacity was so limited by the size of the melting unit that a small-size annealing furnace had been found sufficient to cope with the works' requirements. With the installation of a very much larger steel-melting unit, it was found necessary to install correspondingly increased annealing-furnace capacity. A contract was given to Priest Furnaces, Limited, for a bogie-type annealing furnace, 15 ft. long by 12 ft. wide by 7 ft. high, and as the works were already committed, in

Fig. 15.—Sand Dryer and Storage Bunker.

policy, to the use of pulverised fuel on a large scale, it was decided to adopt this fuel for firing. The furnace roof was, therefore, designed of more than normal height to provide a large combustion volume clear of whatever castings might be paid upon the bogie. The burners are installed in the back end-wall, close to the roof, and are fed from a small storage hopper containing about 7 tons of pulverised fuel. Recording pyrometers are provided at three points in the furnace to ensure correct heat treatment being given to the castings. The fuel, like that for the air furnace, is purchased in tank wagons and blown into the hopper by compressed air.

Two additional double-ended grinders were installed for removing snags and flashes from the castings.

Sand Blast, Air and Water Supplies

In the old foundry there was a sand-blast chamber, operated by a very old compressor at 30 lbs. per sq. in. The capacity of this plant was wholly insufficient for the increased demands caused by the modernisation of the works, and it was decided, therefore, to scrap this old plant and replace it by a modern one by Tilghman's Patent Sand Blast Company, Limited, with a very much increased volume of air at a pressure of 100 lbs. per sq. in. As cooling water is very expensive in the district, it was decided to adopt an air-cooled compressor, and orders were placed with the Ingersoll-Rand Company, for two each of 305 cub. ft. capacity, one of them to operate the sand blast and the other to augment the compressed-air supply of the works for pneumatic hammers, etc.

In addition to the sand-blast apparatus referred to, there was installed a Wheelabrator shot-blast by Messrs. Tilghman's, for dealing with small repetition castings. The Wheelabrator operates by imparting to the chilled shot, energy from a rapidly rotating impeller, and does not, therefore, require any compressed air.

In connection with the compressed-air system, after-coolers have been introduced to reduce the moisture content of the air and, therefore, reduce the wear and tear on the chipping hammers and other pneumatic tools.

Because of the limited supply of cooling water for the after-coolers and the water-cooled air compressor, which was retained from the old equipment, it was decided to contain the cooling water in a closed circuit and pass this through a small cooling tower situated in an overhead tank of large capacity. The discharge water from the after-coolers and air compressor drops to a sump tank below the foundry floor level, from which it is elevated over the cooling tower by a small Drysdale centrifugal pump. Safeguards have been installed to take care of any possible failure either of the pump or of the main water supply.

Roll Lathes, Grinders and Other Machine Tools

Considerable additions to the firm's machining and roll-finishing capacity had to be made. Five of the existing roll lathes were transferred to the new shop. Two of these lathes can take up to 54-in. dia. rolls with lengths of 16-ft. and 22-ft. respectively, and the other three lathes can deal with rolls up to 26 in. dia. and 14 ft. long.

The roll-turning equipment was augmented by the purchase of six lathes and two roll grinders. The largest of these lathes is of Waldrich manufacture, and is capable of machining the heaviest roll used in this country. The large grinding machine—also made by Waldrich—will accommodate rolls up to 46 in. dia. by 20 ft. long, a small Landis grinder deals with rolls up to 18 in. dia., and is fitted for grinding taper necks suitable for Morgoil bearings.

Very special precautions had to be taken to isolate the grinding machines from any possible vibration set up by roll lathes, wobbler shapers, etc.; accordingly these machines were mounted on solid concrete blocks placed in watertight pits and resting on a 4-in. layer of specially prepared compressed cork, sandwiched in three layers of bitumastic felting. Tests carried out with extremely sensitive instruments have proved that the isolation of the grinding machine from external vibrations is complete. Other lathes installed are of the modern traversing type, which can be successfully operated with carbide tools when machining chilled and other special hard rolls.

One of these lathes is capable of taking a roll up to 40 in. dia. by 14 ft. long, and the others will take rolls 24 in. dia. by 8 ft. long.

Further recent additions include a Craven lathe of the most modern construction specially designed for the rapid machining of steel and alloy-steel rolls up to 38 in. dia. by 15 ft. long, and a modern 30-in. roll lathe for turning and finishing grooved rolls up to 20 ft. long.

The machine shop also has its full complement of wobbler shapers, boring mills and planing machines for carrying out special machining on the rolls and when required also for steel castings and plant work.

Electricity Supply

The old and new shops were completely rewired for lighting and power. The electrical supply to the works comprised a service at 11,000 volts, 3 phase, 50 cycles, and a supply at 440 volts, 3 phase, 50 cycles. When a new electric furnace was decided upon, it was considered advantageous to take all electrical

supplies for the works at 11,000 volts, and transform down for the works' power and lighting. The supply company were, therefore, provided with a switch-house in the north-east corner of the site, to which they brought two 11,000-volt feeders, terminating in two Reyrolle switches connected by a bus coupler. In the works' substation is a Crompton Parkinson high-tension switch controlling a 750-k.v.a. transformer, solidly connected on the low-tension side to a Johnson & Phillips low-voltage distribution board.

The original lighting system has been replaced by a planned system of mercury-vapour electrical discharge lamps, with occasional metal filament lamps for the use of night watchmen, and during the striking period of the mercury-vapour lamps. Throughout the machine shop a minimum illumination at the working plane of 15 ft.-candles has been provided and, in the foundry, the illumination varies from 5 to 10 ft.-candles, the former figure being sufficient in the casting bay, while the latter is provided in the moulding and fettling section for the small steel castings. A departure from previous practice has been made in the wiring of these fittings, as Pyrotenax has been used throughout.

Products of the Company

The modernisation of the roll foundry and roll-turning and grinding shops coupled with an up-to-date research department enables the company to produce all types of chilled, grain and special types of iron-base rolls up to 40 tons in weight. With regard to carbon-steel and alloy-steel rolls the plant at present is capable of dealing with rolls up to 12 to 14 tons but with steel-base rolls in the higher carbon ranges, the largest sizes can now be handled and heat-treated.

The close collaboration with their associates, the United Engineering & Foundry Company, of Pittsburgh, U.S.A., who are probably the largest makers of steel and cast-iron rolls in the world has been an important factor in the development of special-quality rolls by the company.

Among other specialities the "Unefco" patent alloy-iron base roll and the "X.L." steel-base roll have proved of immense advantage in the rolling mills of this country and abroad. Considerable improvements in the technique of chilled-roll manufacture tending to reduce the risk of error due to the human element have also taken place.

Roll-grinding, roll-designing and finish turning of all descriptions can be undertaken by the company.

The steel foundry as now completed, may well rank as one of the most modern in the country, well able to meet the increasingly exacting demands for steel castings of highest quality and reliability. With a capacity up to 12 tons finished weight, the company is not only supplying the parent company, Davy & United Engineering Company, Limited, but also a growing number of customers whose requirements range from general engineering, marine and steelworks castings to repetition castings of all sizes and shapes.

Anglo-German Trade Talks

Representatives of the steel tube and general engineering industries have accepted the invitation of the Federation of British Industries to accompany its delegation to Germany to meet the Reichsgruppe Industrie in about a fortnight's time. The F.B.I. announces that, in view of the importance which it attaches to the talks, the following have been invited to be members of the delegation and have accepted:—Lt.-Col. Lord Dudley Gordon, president of the British Engineers' Association and chairman of J. & E. Hall, Limited; Mr. A. C. Macdiarmid, chairman of Stewarts and Lloyds, Limited, the tube makers; and Mr. Roger Duncalfe, vice-chairman of the Association of British Chemical Manufacturers.

Foundry Trades' Equipment and Supplies Association

At a general meeting of the Association, held last Thursday at the Hotel Victoria, Northumberland Avenue, London, S.W.1, Mr. A. C. Turner presiding, the annual report and balance sheet were presented, and what follows is an abstract of the former.

Annual Report, Year Ending December 31, 1938

During the year under review the Association has suffered the resignation of two further members, bringing the total as at December 31, 1938, to 20. The accounts reflect the decrease in membership and show the general expenses to have been a little higher than for the previous year, but, owing to the retention of some £70 revenue derived from the 1937 Exhibition, there is a balance of revenue over expenditure of £36 18s. 2d.

Only one meeting of the Association was held during the year, being the annual general meeting on March 3. The business of this was primarily concerned with exhibition policy. As foreshadowed in the last annual report, the organisers were unable to report to the Association sufficient support for a separate Foundry Trades' Exhibition, to be held again at the Royal Agricultural Hall in conjunction with the International Congress in June, 1939. Although they had prosecuted most exhaustive inquiries, both by personal contact and through correspondence, it appears that many potential exhibitors, including members of the Association, feel that a two-yearly interval is too short between Foundry Trades Exhibitions, and would prefer to revert to the old interval of four years. It has to be borne in mind, however, that practice has shown that an interval of four years does not seem to commend itself to some important interests, as certain equipment manufacturers quite eligible to take space at exhibitions have not done so for eight or ten years. Moreover, a four-yearly interval between exhibitions at the Royal Agricultural Hall resulted in the end in having to abandon those exhibitions in favour of a joint one with the Engineering and Marine Exhibition at Olympia, the only Agricultural Hall Exhibition proving itself financially justified being that of 1929, when it was run in conjunction with one of imported machine tools. There remains the theoretical possibility of an exhibition held every four years in conjunction with the Engineering and Marine Exhibition at Olympia, but that exhibition is held every alternate September, and in the event of the foundry interests being entirely excluded from one of these, the organisers would inevitably have to fill that space with other exhibits, which could not then be readily removed on the next occasion, with the result that space for foundry exhibits might be lost indefinitely. It, therefore, appeared that, whilst it does not seem possible for the Association to lay down a policy for a number of years in the future, there remains the concrete fact that members of the Association under the existing arrangements with the organisers do enjoy a special discount on their space rentals as and when they exhibit at Olympia from time to time under the ægis of the Association, and that the Association itself does also derive revenue by way of commission on the space taken by its members. As a policy for the immediate future, therefore, it was decided that the Association should again support a joint exhibition to be held at Olympia in September, 1939, for the benefit of those of its members who wish to show thereat, but at the same time it should be quite clear that individual members have no obligations, moral or otherwise, to take space at that exhibition should they not wish to do so.

The only other activity of any great importance has been the constitution once again of a central fund for a contribution on behalf of the Association and its members to the Annual Convention of the Institute of British Foundrymen. The sum collected and handed over on this occasion was slightly in excess of that of the previous year, and it is felt that this scheme satisfactorily meets the financial position as between the members of the Association and the Institute in respect of the Convention. The Association maintains the happiest relations with that body and with others affiliated to the industry, and remains in close and amiable contact with them.

The report was signed by Mr. A. C. Turner (President) and Mr. K. W. Bridges (honorary secretary).

The report and balance sheet having been adopted, Messrs. Tilghman's Patent Sand Blast Company was elected to membership.

Mr. G. E. France (managing director of Augusts Limited, of Halifax, was elected President of the Association.

A cordial vote of thanks to Mr. Turner for his work as President during the last two years concluded the business.

Cast-Iron Straightedges

The British Standards Institution has recently issued the second of its specifications in the series of Standards for Engineers' Precision Tools, namely B.S. No. 818 for Cast Iron Straightedges of bow-shaped design. As in the case of the British Standard for surface plates recently issued, the primary object of this specification is to prescribe standards of accuracy, and very little limitation is imposed on design other than requirements as to the minimum overall depths and the widths of the working face for various lengths of straightedges up to 8 ft.

Provision is made for two grades of accuracy, limits being prescribed for the permissible errors in the straightness of the working face, the straightness, parallelism and squareness of the side faces; a minimum percentage bearing area is also prescribed. These standards of accuracy have been prepared in close collaboration with the National Physical Laboratory.

Appendices to the specification contain recommendations as to suitable chemical compositions of plain and alloy cast irons, with their methods of heat treatment for the purpose of stabilising the straightedges, and also a detailed description of the methods of testing straightedges and of determining the proportion of bearing area.

Copies of this specification B.S. No. 818, price 2s. net, 2s. 2d. post free, may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1.

"Holl-O-Cast" Steel Rolls

Ohio Steel Foundry Company, Lima, O., reports some interesting developments in the manufacture of alloy steel "Holl-O-Cast" rolls. Briefly, large rolls are cast hollow by a method which permits removing the core easily. Only a few minutes are required for complete removal of the core. Casting large steel rolls hollow is said to have four outstanding advantages. Ingotism and centre line weakness is reduced. The rapid solidification of large rolls is promoted by a smaller cross section of metal and is aided by the chilling action of the core. This results in a fine-grain structure as cast that is readily improved by heat treatment. Internal hot rupture is positively eliminated. Better heat treatment is said to be possible because heating and annealing stresses are diminished and a more drastic quenching of the roll bodies is permitted. Harder bodies, more refined structures and denser metal are said to improve the quality of large rolls and to be especially important in backing-up rolls to improve their resistance to spalling. Improved resistance of the hollow necks to fatigue increases economy due to longer life.—"Steel."

Alloy Cast Iron

By H. A. MacCOLL, B.Sc.

(*Continued from page* 190.)

It has just been indicated that addition of nickel to a grey cast iron will result in higher strength, but the strength increase obtained by a simple nickel addition is small, and not sufficient in itself to warrant the extra cost. Tables III and IV, taken from one of Everest's Papers,[7] show the effect of nickel additions up to 2 per cent. on a motor cylinder iron, and an iron for heavier engineering practice. It will be noted that in the first table, the strength increase is

Table III.—*Mechanical Properties of Nickel Cast Iron.* (Everest.)
Material: T.C, 3.30; Si, 2.08; Mn, 0.96; S, 0.10; P, 0.18 per cent.

Test-bars.	A 20	A 21	A 22	A 23
Nickel content. Per cent.	0	0.699	1.12	1.84
Ratio GC/T.C. Per cent.	81.5	81.8	81.4	81.2
Transverse:				
Max. stress. Cwt. ..	25.36	25.52	26.68	24.58
Deflection. Inch ..	0.37	0.40	0.43	0.37
Modulus of rupture .. Tons per sq. in. ..	33.65	33.87	35.38	32.60
Tensile. Max. stress. Tons per sq. in. ..	12.74	13.09	13.32	13.25
Brinell hardness:				
1 in. sect. ..	192	197	199	207
½ in. „	192	199	210	217
¼ in.	299	229	229	235
⅛ in.	229	235	235	241

Note.—Transverse tests on I.B.F. "M" bar, 1.2 in. dia. 18-in. centres. Tensile tests on bars 0.798 in. dia., machined from lower end of transverse test-bars.
Hardness tests on standard step bars.
Each result is the mean of two or three determinations.

of a very small order, and that in the second table a decrease is shown; at the same time, whilst the effect of the nickel on the tensile properties is inconclusive, the equalisation tendency is apparent from the hardness figures. However, the graphitising action of nickel being established, it was logical to suppose that more noticeable effects might be obtained if the silicon content of an iron was reduced coincident with the introduction of the nickel, and further experiments were conducted to this end. Using an automobile cylinder iron as a base material, Hanson[10] obtained the results shown in Table V, which demonstrate quite conclusively that by

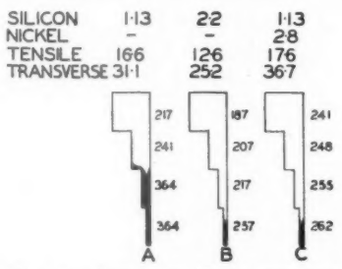


Fig. 2.—Step Bar Tests showing Influence of Ni and Si on Cast Iron.

altering the composition of the base iron to suit the nickel addition appreciable increase in tensile strength can be obtained.

Experience since the publication of this work has shown that the optimum effect is attained when each part of silicon is replaced by two to three parts of nickel.

It is, of course, well known that enhanced strength may always be obtained by the simple expedient of reducing the silicon content of a given iron, but the advantages of achieving this result by the use of nickel will be seen from a study of Figs. 2 and 3.

Fig. 2 shows the tensile strength, hardness and extent of chill in three step bars. Considering B it will be noted that the strength may be increased either by reducing the silicon, giving bar A, or by reduction of silicon, and addition of nickel, giving bar C, but whereas simple reduction of silicon results in enhanced strength at the expense of considerable increase in chill, the alternative method has secured even better mechanical properties, whilst maintaining the chilling tendency at the same level. Fig. 3

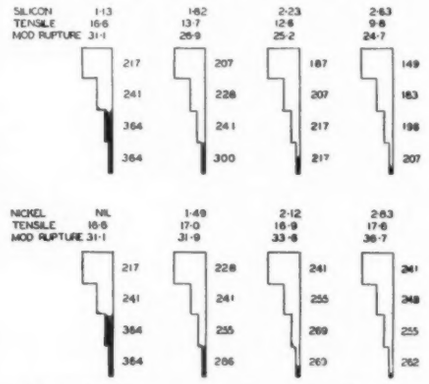


Fig. 3.—Control of Chill by Nickel and Silicon.

illustrates control of chill by silicon and nickel respectively, and it will be seen that, whereas reduction by silicon is accompanied by marked decrease in tensile strength, the figures for the nickel irons remain approximately constant. The hardness figures demonstrate clearly the equalising action of the nickel. In the thick section (1 in.) the variation on the silicon bars is 90 points against 24 points for the nickel bars, whilst the variations between the thick and thin sections (⅛ in.) are 93, 30 and 58 points for the silicon bars, against 58, 28 and 21 points for the nickel bars. Consideration of these Brinell figures indicate that a large stride has been made towards the removal of the inequalities in mechanical properties in differing sections, which, in the eyes of the engineer, provide an argument for not using cast iron. It should also be noted that the Brinell figures in the nickel bars remain throughout at a higher level than the silicon bars, indicative of a tougher matrix and better wear resistance.

There remains the important question of machinability. If hardness be increased by a reduction of silicon, the tendency to chill in the thin sections is increased, and in many cases the result will be that, when the silicon is reduced to the lowest permissible figure which will allow easy machining of the thin sections, it will be found that the hardness is insufficient in the heavier sections. In such circumstances, the influence of nickel in increasing the general overall hardness is of particular value (Fig. 4). Space limitations preclude further considerations of the effect of nickel on machinability, and ample literature on this aspect is available.

So far, the advantages claimed for nickel additions have been from the engineers' standpoint, but nickel can also be a good friend in the foundry. By virtue of grain refinement and matrix hardening, nickel assists greatly in the production of pressure tightness and general

Table IV.—*Mechanical Properties of Nickel Cast Iron.* (Everest.)
Material: T.C, 3.4; Si, 1.56; Mn, 0.49; S, 0.099; P, 0.74 per cent.

	M 0	M 1	M 2	M 3
Nickel content. Per cent.	0	0.5	1.13	2.08
Transverse:				
Max. stress. Cwt. ..	22.16	23.48	21.10	20.84
Deflection. Inch ..	0.258	0.283	0.238	0.242
Modulus of rupture. Tons per sq. in. ..	29.4	31.1	28.0	27.6
Tensile strength. Tons per sq. in. ..	15.45	14.99	14.4	13.7
Brinell hardness:				
1 in. sect. ..	217	—	228	231
½ in. „	228	—	228	228
¼ in. „	235	—	241	255
⅛ in. „	269	—	269	262
Drill hardness	108	—	137	109

elimination of porosity, draws, etc. In reading through the literature available, the author has found that these claims are fully substantiated by the experience of actual users of nickel as revealed in the discussions following the presentation of many Papers. Attention is drawn to this point because many people who have not had personal experience of alloy additions are sceptical of claims advanced as the result of experiments on a laboratory scale.

The foregoing constitutes a brief outline of the properties to be expected from grey irons to which simple and "balanced" additions of nickel have been made.

Table V.—*Effect of "Balanced" Nickel-Silicon Content on Mechanical Properties.* (Hanson.)
Material: Automobile Cylinder Iron, T.C, 3.2 to 3.3; Mn, 0.9; Si, 0.10; P, 0.18 per cent.

Ni. Per cent.	Si. Per cent.	Transverse tests.* Load. Cwts.	Transverse tests.* Mod. of rupture. Tons/sq. in.	Tensile strength.† Tons/sq. in.	Brinell numbers (step bar). 1 in.	½ in.	¼ in.	⅛ in.
0	2.0	25.36	33.65	12.74	192	192	229	229
0.7	2.0	25.52	33.87	13.09	197	199	229	235
1.12	2.0	26.68	35.38	13.22	199	210	229	235
0‡	1.3	—	—	—	228	250	364	340
0.93‡	1.29	26.6	35.3	16.84	212	228	242	251
1.84‡	1.35	28.0	37.4	16.70	225	241	251	286
1.22	1.42	29.46	39.0	18.5	226	232	273	292
1.12	1.44	28.43	37.6	20.5	228	230	250	386

* Transverse tests on standard I.B.F. "M" Bars.
† Tensile tests, pieces cast 1.2-in. diameter and tested 0.9 in.
‡ Carbon rose to 3.40 per cent. in these irons.

Chromium

Additions of chromium to cast iron have also been the subject of intensive research. Chromium may be regarded as the antithesis of silicon, for it is essentially a carbide promoter and stabiliser. If silicon is taken as having unit tendency to promote the formation of graphite,

then the tendency of chromium to the same end may be considered as − 1.2. Work by Keep[22], Campion[23], Smalley[24], Piwowarsky[25] and others has shown that additions of chromium up to 0.5 per cent. in conjunction with silicon contents of 1 to 2 per cent., result in increases in the tensile and transverse strengths, and the hardness. As might be expected from the anti-graphitising action of chromium, even additions of under 1 per cent. will render the iron unmachinable if the silicon content be low, and in this connection Pfannenschmidt[26] found that with silicon contents of 1.5 and 2.3 per cent. the limiting additions of chromium which could be made whilst preserving machinability were 0.4 and 0.7 per cent. respectively, for sand-cast bars $1\frac{3}{16}$ in. diameter.

Table VI.—*Effect of Nickel and Chromium on Cast Iron.* (Hanson.)
Material: Automobile Cylinder Iron, T.C., 2.9 to 3.0; Mn, 0.85; S, 0.10; P, 0.17 per cent.

Ni. Per cent.	Cr. Per cent.	Depth of chill on ½-in. step.	Brinell hardness. 1 in.	½ in.	¼ in.	⅛ in.	Transverse test on standard "M" bar. Max. load. Cwts.	Mod. of rupture Tons/sq. in.	Tensile strength. Tons per sq. in. 1.2-in. bars.	0.875-in. bars.
nil	trace	0.5 in.	199	213	228	241	28.15	37.3	15.3	19.4
1.02	trace	trace	210	217	335	241	26.93	35.7	16.8	18.8
1.10	0.27	trace	228	231	238	241	28.27	37.5	18.6	20.5
1.14	0.414	0.35 in.	230	238	258	269	28.15	37.3	18.0	22.45

Table VII.—*Suggested Ratios for Nickel-Chromium Additions to Cast Iron.* (Hanson.)

Chromium added.	Nickel : Chromium ratio.
Less than 0.2 per cent.	3 to 1
0.2 to 0.3 per cent. ..	4 to 1
0.3 to 0.4 per cent. ..	5 to 1

Chromium exists in chromium cast irons as a double carbide of iron and chromium in the pearlite. This double carbide is very much more stable than the plain cementite, particularly at elevated temperatures; consequently chromium irons find important application in the heat-resistance field. Donaldson[27] has studied the effects of chromium additions up to 0.9 per cent., at which figure he obtained complete stability even after 200 hrs. at 550 deg. C.; at the same time the specimens showed complete resistance to growth, contractions being observed instead. In actual practice, however, plain low-chromium irons have a limited application, their use being confined to wear resisting irons and irons of moderate heat resistance.

Table VIII.—*General Recommendations for Nickel-Chromium Cast Irons.* (Bur. Inform. on Nickel.)

——	T.C	Si	Mn	Ni	Cr
For medium sections ..	3.2	1.6	0.7	1.25	0.5
For heavy sections ..	3.2	1.0	0.7	1.25	0.5
Hard grey iron.. ..	3.3	1.2	0.8	3.0	0.5

Table IX.—*Typical Analyses and Applications of Nickel-Chromium Cast Irons.* (A.F.A. Handbook.)

——	T.C.	Si.	Mn.	Ni.	Cr.
Light automobile cylinders	3.3	2.1	0.6	0.75	0.3
Heavy automobile cylinders	3.3	1.85	0.65	1.5	0.6
Light forging dies* ..	3.3	1.5	0.6	1.5	0.6
Heavy forming dies* ..	3.0	1.25	0.6	2.75	0.8
Brake-drums	3.25	2.0	0.65	1.5	0.6
Light cylinder liners ..	3.25	2.0	0.6	1.5	0.6
Caustic pots	3.3	0.7	0.5	1.5	0.6
Clutch plates	3.3	2.1	0.65	1.25	0.4
Permanent moulds ..	3.25	1.75	0.6	1.55	0.6

* Heat treated.

Another group of plain chromium irons exists in which chromium contents of 15 to 35 per cent. are used in conjunction with carbon contents as low as 1.8 per cent. As in the case of the low chromium irons, these high alloy irons are used for wear- and heat-resisting work.[28]

Although, as indicated, the uses of plain chromium irons are limited to certain specific fields, chromium is a very valuable alloying element when used in conjunction with other additions. The most popular combination is that of nickel and chromium, which will be considered next.

Nickel-Chromium Irons

Chromium hardens iron by virtue of promoting carbide formation; consequently, as in the case of silicon and nickel, a "balanced" nickel-chromium addition may be used with advantage, as is shown in Table VI. The nickel will harden the matrix and so also will the chromium, but the graphitising action of the nickel will resist the chilling tendency of the chromium, since it is found that this characteristic of nickel is preserved unaltered in the presence of the chromium. Hence, an iron of greater toughness is obtained without sacrifice of machining properties. It should be mentioned here that experience has shown that, in the case of pressure castings, superior results are obtained by simple nickel addition and reduced silicon content. In one of their Papers, Hanson and Everest[11] suggested that the ratio of nickel to chromium should be varied according to the quantity of chromium added. Their suggestions are shown in Table VII. Later experience has shown that, in general, two or three parts of nickel to one part of chromium prove quite satisfactory. As regards actual quantities of these elements, British practice appears to favour the retention of the chromium at about 0.5 per cent., with a total carbon of about 3.2 per cent. and a manganese content of 0.7 per cent., the nickel and silicon being varied to suit requirements. Typical recommendations are set out in Table VIII.

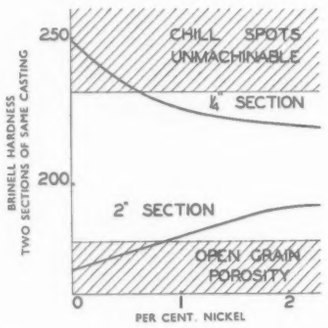


Fig. 4.—Showing Influence of Nickel on Brinell Hardness of Cast Iron.

American practice tends to the use of slightly higher values of nickel and chromium, approximately the same total carbon, and a reduction in the manganese to 0.6 per cent. or less. Typical analyses are shown in Table IX.

(To be continued.)

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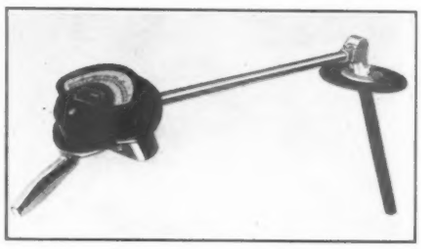
American Notes

The FerroTemp Pyrometer

The Harry W. Dietert Company, of 9,330, Roselawn Avenue, Detroit, Michigan, have placed upon the market a pyrometer (FerroTemp) for measuring accurately the temperature of molten grey and white iron by means of an immersion thermocouple. The thermocouple of the FerroTemp is 1¼ in. outside diameter and 19 in. long. The depth of immersing the thermocouple into the molten metal does not affect the accuracy of temperature readings. The life of the thermocouple is of the order of one hundred immersions. Every thermocouple receives a stabilising treatment ensuring accuracy for life of the couple. The iron and slag will not adhere to the thermocouple. The reading comes to the maximum temperature 15 secs. after immersing the thermocouple in the molten metal.

The pyrometer is available in two models. There are a portable type (as illustrated) and a stationary type similar to the portable model with exception that a flexible extension lead connects the instrument to a wall-type pyrometer with a large dial which may be read at 50 foot distance.



The FerroTemp Pyrometer. Harry W. Dietert Company.

The portable model is equipped with a sturdy meter having non-breakable crystal covering the bold-type temperature scale, which is 6 in. long. The temperature scale reads from 870 to 1,760 deg. C. The smallest temperature division on the scale is 10 deg., allowing easy estimation to 5 deg. at a glance. The weight is 8 lbs. The overall length is 47 in.

The stationary model is designed to operate at a fixed location in the plant. It has the advantage of working in conjunction with a large pyrometer which records the temperatures.

* * *

Fire Hydrant Castings

The Canada Valve & Hydrant Company, of Brantford, Ontario, has solved the problem of producing fire-hydrant and hose valves strong and tough enough to resist damage caused by inexperienced operators. The solution was the outcome of studies undertaken by this firm which revealed that an addition of from 2 to 5 per cent. nickel to the customary bronze alloy used for valve and hydrant purposes increased tensile strengths by approximately 12 per cent., and elongation was increased on an average of 20 per cent. Now the main seat ring and the cast parts of hose valves, with the exception of spindle and discs, have the nickel-bearing material which, it was found, reduced foundry production losses by 75 per cent., and failures were almost entirely eliminated.

Of interest to Pig Iron Users

THE STANTON METALLURGICAL SERVICE

The Stanton Company believe that a mutual policy of collaboration in more scientific and better methods of manufacture, can do much to widen the field for cast-iron products.

The Stanton Company therefore offer to all those engaged in the Iron Foundry Trades the free advisory service of specialists in metallurgical practice and technique.

This service takes the form of analyses and tests by the Company's Research Department on castings submitted to them, and constructive suggestions if the desired results are not being attained.

Where there are difficulties in works practice which can best be investigated on the spot, the service provides for a personal visit from a Stanton metallurgical expert, who will collaborate with the foundry staff.

THE STANTON IRONWORKS COMPANY LIMITED
Near NOTTINGHAM

The Largest Producers of Foundry Pig Iron (for Sale) in Great Britain

The Week's News in Brief

Trade Talk

PARAMOUNT STEELS, LIMITED, is being wound up voluntarily. Mr. John C. Hawkesworth, 30-34, Eagle Wharf Road, London, N.1, is the liquidator.

A. HALL & COMPANY, LIMITED, shipbuilders and engineers, Aberdeen, has received an order for a pontoon bucket dredger and two hopper barges. The dredger will be 160 ft. long and will be made to dredge to a depth of 60 ft.

EMPLOYMENT for about 600 men will be found as a result of a decision to restart plant at the Malleable Works, Stockton-on-Tees, which has been idle a year. Two furnaces are being started at once, and another three will be put into operation later.

THE LONG EXTANT PLAN for erecting an iron and steelworks in Norway at Moin Rana is now obtaining more general support, and the plant is estimated to cost 35 million kr. A proposal to erect the works is to be submitted to the Norwegian Storting shortly.

THE TOWER OF EMPIRE at the Glasgow Exhibition is to be sold for scrap, and will probably realise about £10,000. It cost almost £60,000, and was one of the most popular features in the Exhibition. Glasgow Corporation and two Clydeside resorts have rejected proposals to purchase the tower.

TRADE IMPROVEMENT is reported by the United Patternmakers' Association. Mr. Alan Findlay, general secretary, states that the number of unemployed is 534, a decrease of 85 compared with the last report. The total of 534 registered as idle is, however, much higher than a year ago.

HEAD, WRIGHTSON & COMPANY, LIMITED, of Thornaby-on-Tees, have received a contract for tinning equipment from the Polish Steel Trust. The machines are similar to those supplied by the company in 1938 to the Ebbw Vale Steelworks for Richard Thomas & Company, Limited.

THE LARGEST electrical winder ever constructed in this country has just been completed and made ready for shipment by Fullerton, Hodgart & Barclay, engineers, Paisley, to the Champion Gold Mines, Southern India. The winder, of the conical drum type, has a maximum diameter of 35 ft., and will carry over a mile of metal rope.

AN EARLY DECISION by the Government regarding its plans for helping the shipping industry and the creation of a reserve of merchant ships in case of emergency was foreshadowed by Mr. Ernest Brown, Minister of Labour, speaking at the annual dinner on March 3 of the North-East-Coast Institution of Engineers and Shipbuilders at Newcastle-upon-Tyne.

TWO HUNDRED THOUSAND FARMERS are being invited this summer to visit the works of R. A. Lister & Company, Limited, at Dursley (Glos). Numerous visits to the Lister works have been arranged in the past, but this is the first occasion on which an inspection on this scale has been planned. To deal with the problem a traffic manager has been appointed.

THE ADMIRALTY has placed orders for the construction of the two battleships of the 1938 programme with Vickers-Armstrongs, Limited, Newcastle, and Cammell Laird & Company, Limited, Birkenhead. The 1938 naval building programme comprises in addition four large and three small cruisers, an aircraft carrier, three submarines, three minelayers, two depôt ships, a Fleet Air Arm supply and repair ship, and many smaller craft.

THE INSTITUTION OF CHEMICAL ENGINEERS announces that the Osborn Reynolds Medal has been awarded to Mr. Hugh Beaver for "valuable construction work." Mr. Beaver took a prominent part in the organisation of the Chemical Engineering Congress in 1936. The Moulton Medal has been awarded jointly to Dr. J. H. Dobson and Professor W. J. Walker, of Johannesburg, for their work on engineering problems associated with the improvement of conditions in mines.

AFTER protracted negotiations between the Government of the Dutch East Indies and the Billiton concern, the latter has received a concession to work extensive deposits of nickel, iron, chrome and manganese ore deposits in central Celebes. A new company is to be formed for the purpose—Mijnbouw Maatschappij Midden-Celebes. The nickel ores are reported to be similar to those in New Caledonia, but with a smaller Ni content. High-grade iron-ore deposits are also suspected. Japan is regarded as a potential market for the ore output.

Personal

LORD MCGOWAN, chairman of Imperial Chemical Industries, Limited, has left Capetown for England in the "Stirling Castle."

MR. M. A. H. DICK has joined the Board of Directors of Wailes Dove Bitumastic, Limited, of Newcastle-upon-Tyne.

MR. R. J. TURNER (export manager of C. C. Wakefield & Company, Limited) has been re-elected Chairman of the Institute of Export for the fourth year in succession.

MR. T. R. WALKER, M.A., F.I.C., the honorary secretary of the Sheffield Branch of the Institute of British Foundrymen, has changed his home address to 11, Broomgrove Crescent, Sheffield, 10.

MR. WILLIAM WYPER, who started work 25 years ago in the Lanarkshire Steel Works, Motherwell, and rose through various grades to the position of mill manager, leaves next week to take up the post of assistant mill manager with the Steel Corporation of Bengal, Limited.

MR. C. A. WINN has been appointed to the board of C. H. Bailey, Limited, as joint managing director, and will be taking up his appointment next month. C. H. Bailey, Limited, have ship-repairing establishments at Cardiff, Newport, and Barry, and a foundry at Cardiff.

Obituary

MR. JOHN HENRY PEASE, formerly managing director of the Normanby Ironworks Company, has died at his home in Dorset, aged 67.

MR. PERCIVAL W. FLAVEL, head of the firm of Sidney Flavel & Company, Limited, ironfounders, of Leamington, died suddenly in London on Tuesday last.

MR. GEORGE BADGER, who had been connected with Hadfields, Limited, for nearly 30 years and was an expert on crushing machinery and plant, died last week at his home in Sheffield.

MR. ERNEST ALFRED FENDICK, of 22, Finedon Road, Wellingborough, Northants, a director of Mather (Wellingborough), Limited, engineers, ironfounders, etc., Wellingborough, died on February 27, aged 60.

MR. JOHN MOCHRIE, who retired about 15 years ago after over 60 years with Smith & Wellstood, Limited, Columbian Stove Works, Falkirk, collapsed and died while out walking on March 3. He was 88 years of age.

MR. ALBERT SENIOR, a local director of Thos. W. Ward, Limited, died in a Sheffield nursing home on Sunday, February 26, at the age of 53. Mr. Senior commenced his career with Thos. W. Ward, Limited, in 1898. For over 35 years he had been actively connected with their scrap iron and steel department, and was well known in this connection throughout the country.

WE REGRET to announce the death, last Friday, of Mr. J. B. Corrie, chairman of Foundry Equipment, Limited, of Leighton Buzzard. Mr. Corrie was well known and esteemed all over the world, as his company, J. B. Corrie & Company, sold the products of British engineering and iron and steel companies in India, South America and France. His main items of business used to be Sheffield-made railway material, machine tools from Manchester, hydro-electric schemes, electric furnaces. Business conditions after the war changed, and exports were made more difficult, so a start was made with importing machinery. For a time Mr. Corrie's firm acted as agents for the British Empire for Alfred Baillot et Cie of France, but again trading conditions altered with the change in the British fiscal system from free trade to a protected market. In conjunction with Mr. Baillot, Mr. A. S. Beech, and his son, Mr. A. G. Corrie, a works was established at Leighton Buzzard for the manufacturing of a complete range of foundry plant. Mr. Corrie's life work is illustrative of the changes which have taken place in industry during the last fifty years, and the courage and enterprise he has shown in adapting his business efforts to ever changing conditions have made a noteworthy contribution to engineering progress.

New Companies

(From the Register compiled by Jordan & Sons, Limited, Company Registration Agents, 116 to 118, Chancery Lane, London, W.C.2.)

S. Clark & Sons (Iron Founders), Limited.—Capital, £2,000. Directors: F. Turner, 19, Highcliffe Road, Mount Pleasant, Batley; H. S. Clark and F. Hirst.

Castalloy, Limited.—Capital, £100. General metal founders, etc. Directors: S. White, 43, Upper Bridge Road, Redhill, Surrey; A. E. A. Higginbottom and A. Ratcliffe.

North British Furnace & Tool Company, Limited, Temple Place, Temple Street, Manchester.—Capital, £1,000. Directors: R. G. Davies, W. A. W. Thompson, H. Loukes and F. A. Deaville.

Cook & Company, Manchester, Limited, 18, Exchange Street, Manchester.—Capital £100,000. To take over the business of ironfounders, mechanical engineers and manufacturers of textile and other machinery carried on at Manchester and at the Standard Works, Altrincham, and elsewhere by the Rockliffe Engineering Company, Limited. Directors: N. Cook, J. Jowett and A. H. Milnes.

Contracts Open

Marple, March 15.—Cast-iron pipes and specials, wrought-iron steam tubing and fittings, I.G.E. red coated; rubber-insulated cables and paper-insulated cables, for the year ending March 31, 1940, for the Urban District Council. Mr. J. K. Law, gas and electricity manager, Gasworks, Marple Bridge, near Stockport.

Stafford, March 16.—1,200 yds. of 6-in., 7,500 yds. of 4-in. and 13,600 yds. of 3-in. spun-iron pipes and special castings, for the Rural District Council. Elliott & Brown, consulting engineers, Burton Buildings, Parliament Street, Nottingham.

York, March 11.—Cast-iron pipes and special castings (5 in. dia. to 12 in. dia.), for the Town Council. Mr. C. J. Minter, city engineer, Guildhall, York. (Fee £1 1s., returnable.)

Forthcoming Events

MARCH 13.

Institute of Metals (Scottish Section).—Annual general meeting at the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, at 7.30 p.m.

MARCH 14.

Institute of Metals (North-East Coast Section):—"Die Casting," by G. E. Lewis, at King's College, Newcastle-upon-Tyne, at 7.30 p.m.

MARCH 15.

Manchester Metallurgical Society:—Annual general meeting, Papers by Junior Members, at the Assembley Rooms, Blackfriars House, Blackfriars Street, Manchester, at 7.15 p.m.

Institute of British Foundrymen

MARCH 13.

East Midlands Branch (Lincolnshire Section):—"Examples of Practical Moulding," by F. G. Butters, at Lincoln Technical College, at 6.45 p.m.

Scottish Branch (Falkirk Section):—"Thirty Years' Progress in Cast Iron," by A. B. Everest, Ph.D., at the Temperance Café, Lint Riggs, Falkirk, at 7.15 p.m.

MARCH 14.

Lancashire Branch (Burnley Section):—Annual general meeting, election of officers and short Papers, at the Municipal College, Ormerod Road, Burnley, at 7.30 p.m.

MARCH 17.

Lancashire Branch (Junior Section):—"The Production of Brass and Iron Castings," by W. Brown, at the College of Technology, Manchester, at 7.30 p.m.

Middlesbrough Branch:—Annual general meeting, followed by "The Modern Manufacture of Machine Tool Castings," by J Blakiston, at Cleveland Scientific and Technical Institution, at 7 p.m.

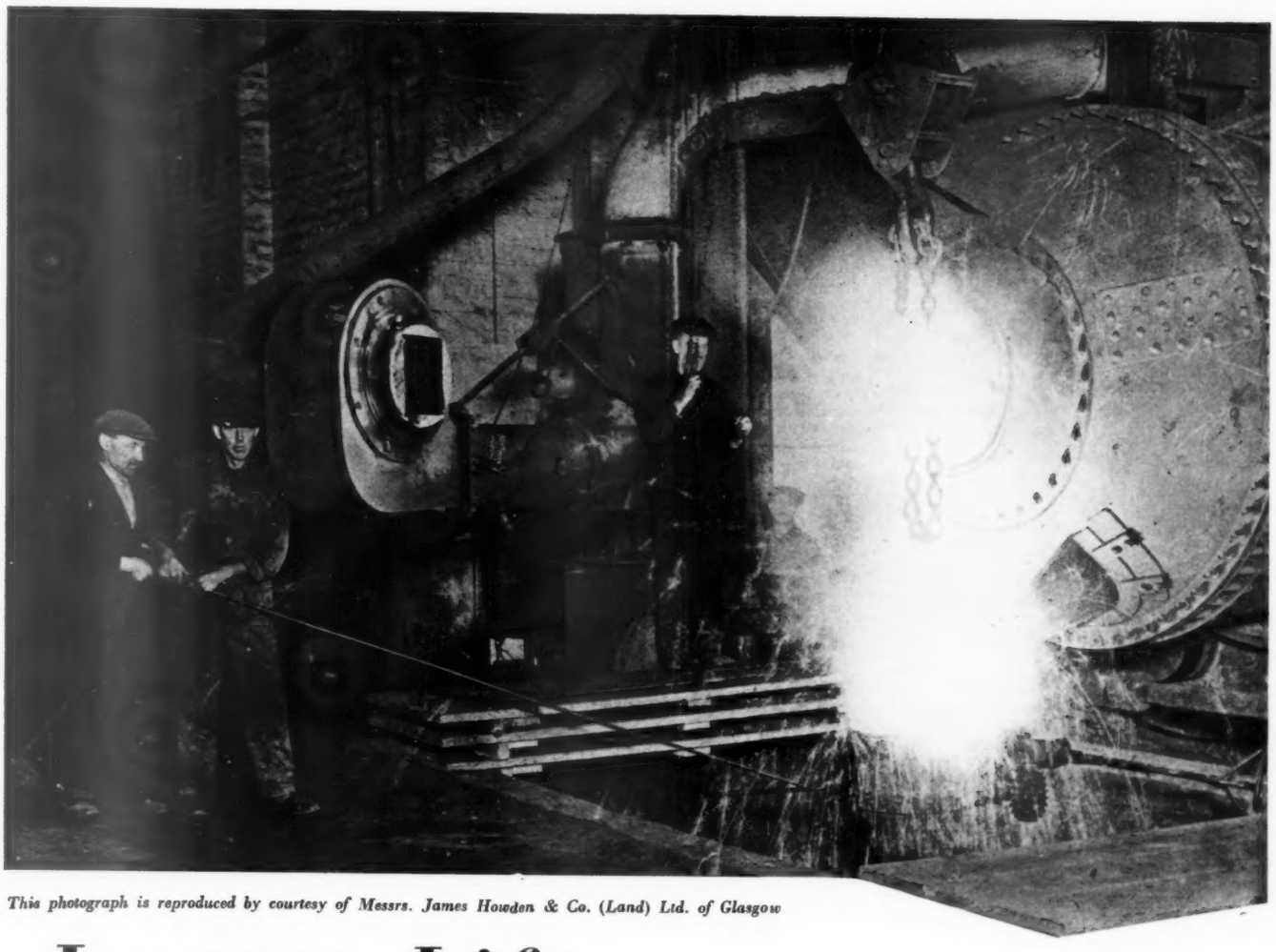
MARCH 18.

Wales and Monmouth Branch (Bristol Section):—"Some Factors in the Production of Electric Steel Castings," by J. F. Gist, at the Merchant Venturers' Technical College, Bristol, at 7 p.m.

The Institute of Vitreous Enamellers

MARCH 16.

Southern Section:—Exhibition of a film at Charing Cross Hotel, Strand, W.C.2, at 8 p.m.



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Raw Material Markets

During the past week or two there has been a general improvement in the iron and steel trades. Consumers are displaying increased confidence in the future, while the export market, which has been so dull for many months, shows some indication of returning animation. As yet, business in most areas does not extend beyond a month or two ahead as far as home trade is concerned, but buyers are expected to enter into forward contracts in the near future.

Pig-Iron

MIDDLESBROUGH.—In the Cleveland iron trade there has been a moderate amount of booking for March deliveries, but beyond that little has been done. Apparently, there is some hope among consumers that lower prices will obtain during the second quarter of the year, but this does not seem likely. Working time among the local foundries is slow to improve and short time is still general. For delivery in the Middlesbrough or Falkirk districts, No. 1 foundry iron is quoted at 102s., with No. 3 G.M.B. at 99s., No. 4 foundry and No. 4 forge 98s., all less 5s. per ton rebate.

The tone of the hematite section of the market continues to improve. Consumption is on a better scale, while some users are anticipating their future requirements by entering into forward contracts. Production is steady, and there will be no need to reduce current outputs if the demand is maintained on the present scale; in fact, an expansion of the make may become necessary within a month or two. The export trade is confined to small tonnages, but there has been a definite improvement in this section of late. East Coast hematite mixed numbers are invoiced at 120s. on the North-East Coast, 125s. 6d. in Sheffield, and 131s. in the Midlands.

LANCASHIRE.—While the outlook in this area is viewed in a rather more favourable light, there is really little to justify this. Until there is a pronounced change in the condition of the textile-machinery trade, the demand for foundry iron will not become satisfactory, and there are few signs of any improvement in this section at the moment. Speciality engineers are working good time and their requirements of foundry iron are on a heavy scale. Most of the jobbing foundries are quiet, but there has been some increase of business among these concerns of late. The demand for hematite is still disappointing, but is better than it was a few months ago.

MIDLANDS.—Owing to the continued quietness of the light-castings industry, the call for supplies of high-phosphorus pig-iron remains at a low level. New business is restricted to small parcels for prompt delivery. It is being suggested that in the circumstances the prices of pig-iron in this area are too high to encourage further trade, but there does not appear to be much likelihood of any reduction. For delivery to Birmingham and Black Country stations, Derbyshire No. 3 iron is quoted at 101s., with Northamptonshire No. 3 at 98s. 6d., less 5s. rebate. Deliveries of low-phosphorus iron are being made at a very satisfactory level; the firms engaged on Government contracts, especially, are using heavy tonnages of this material. Prices vary from £5 5s. to £6 per ton. For Scottish iron as much as £6 10s. is being paid. Consumption of hematite is much better than it was a short time ago; contract deliveries are being taken up much more regularly, but as yet there has not been very much new business.

SCOTLAND.—The foundry iron market in this area remains in a rather depressed state. New orders are of a hand-to-mouth nature and very few consumers will consider entering into forward commitments. Short time at the light-castings foundries continues to be general. No. 1 foundry iron is quoted at 108s., with No. 3 at 105s. 6d., f.o.t. furnaces. Hematite iron is in moderate demand, but largely under existing contracts. It is understood that there has been some business done in basic iron for delivery up to the end of the year. Quotations for steel-making irons are: Hematite mixed numbers, 120s. 6d.; basic, 92s. 6d., delivered steelworks.

Coke

All grades of coke are in good demand and the ovens are busily engaged in dealing with current orders. Foundries are buying on a good scale, thus ensuring their future requirements. Supplies are freely available. For delivery to Birmingham and district, the minimum price for Durham and Welsh coke is 50s. 6d.

Steel

Government orders continue to be the mainstay of the steel market, and works which would otherwise be badly placed for business are active on producing steel in connection with defence. There are still some departments which are quiet, notably those dealing with the requirements of the shipbuilding industry. Medium and light sections of steel are in good demand, but heavy sections are not well taken up. On the whole, however, the structural concerns are well employed. Sheets are in heavy request, and, in addition to the requirements of the Government, there has recently been more business for civil work. An expansion of trade has been brought about in the tube industry and strip is in strong demand.

Scrap

Available supplies of most grades of iron and steel scrap are insufficient to meet the current demand, a state of affairs in marked contrast to that which obtained only a few weeks back. The steelworks undoubtedly have led the revival and consumption by these concerns is very satisfactory. In fact, it seems likely that imports of scrap will have to be increased in order to meet the needs of the steel plants. Most merchants have their available tonnages booked over some time ahead.

Metals

Copper.—Conditions in this market remain on the quiet side, with buying on industrial account dull. The slightly better tone on Wall Street has tended to strengthen the market in this country, but consumers will not alter their hand-to-mouth buying policy. In the United States, a better inquiry has been reported, and business has been moderately good. There is still no change in the official quotation of 11.25 cents per lb., delivered Connecticut Valley, but outside sales are being made at 10.75 cents.

Metal Exchange quotations were as follow :—

Cash.—Thursday, £41 18s. 9d. to £42; Friday, £42 2s. 6d. to £42 3s. 9d.; Monday, £42 17s. 6d. to £42 18s. 9d.; Tuesday, £42 15s. to £42 16s. 3d.; Wednesday, £43 6s. 3d. to £43 8s. 9d.

Three Months.—Thursday, £42 5s. to £42 6s. 3d.; Friday, £42 7s. 6d. to £42 10s.; Monday, £43 3s. 9d. to £43 5s.; Tuesday, £43 1s. 3d. to £43 2s. 6d.; Wednesday, £43 12s. 6d. to £43 13s. 9d.

Tin.—The monthly statistics of this metal have not caused any surprise. Mr. W. H. Gartsen (Henry Rogers, Sons & Company) announces that the total visible supply on February 28 was 24,489 tons, as compared with 21,924 tons on January 31. The carry-over in the Straits Settlements was 7,547 tons, against 9,065 tons, while the carry-over at the Arnhem (Holland) smelter was 1,524 tons, against 1,959 tons. Thus, there was a net increase of 612 tons during February.

The market during the past week has presented a rather featureless appearance and trade has been very quiet. There has been a further improvement in the condition of the South Wales tinplate market and the trade is employed at over 52 per cent. of capacity. Good business is being done in the home market, but additional orders would be welcomed from overseas.

Official quotations were as follow :—

Cash.—Thursday, £214 5s. to £214 10s.; Friday, £214 7s. 6d. to £214 10s.; Monday, £214 15s. to £215; Tuesday, £215 to £215 5s.; Wednesday, £215 10s. to £215 15s.

Three Months.—Thursday, £213 10s. to £213 15s.; Friday, £213 15s. to £214; Monday, £214 10s. to £215; Tuesday, £214 5s. to £214 10s.; Wednesday, £215 to £215 5s.

Spelter.—This market continues to hang fire. Consumers are not at all active, with certain exceptions, and are only buying as their requirements arise. The galvanisers have a moderately good amount of work on hand in dealing with the A.R.P. work, but most other working-up industries are badly placed for orders.

Daily market prices :—

Ordinary.—Thursday, £13 12s. 6d.; Friday, £13 11s. 3d.; Monday, £13 13s. 9d.; Tuesday, £13 11s. 3d.; Wednesday, £13 16s. 3d.

Lead.—There has not been any notable feature in this market during the past few days, and consumers appear to be indifferent to new business. It is reported that negotiations are proceeding in connection with the lead control scheme, and an official statement may be forthcoming later this month.

Day-to-day quotations :—

Soft Foreign (Prompt).—Thursday, £14 3s. 9d.; Friday, £14 6s. 3d.; Monday, £14 8s. 9d.; Tuesday, £14 6s. 3d.; Wednesday, £14 12s. 6d.

Scrap.—There has been a welcome improvement in the condition of this market of late. Although only small, there has been some expansion in the number of orders placed. The demand from the Continent is still on the small side.

Approximate selling prices for old metal:—New aluminium cuttings, £70; rolled, £54 to £55; cast, £32; foil, £80. Copper, £38 to £42; braziery, £35. Brass (clean), £20 to £23. Zinc, £10. Lead, £13 5s. Gunmetal, £38.

Company Reports

James Booth & Company (1915), Limited.—Dividend of 15 per cent. on the ordinary shares for the year 1938.

Head, Wrightson & Company, Limited.—Half-yearly dividend on the 6 per cent. cumulative preference shares.

Harland Engineering Company, Limited.—Half-year's dividend of 3 per cent. on the 6 per cent. preference shares.

Worthington-Simpson, Limited.—Dividend of 7 per cent. on the ordinary shares for the year to December 31 last.

Bairds & Dalmellington, Limited.—Net profit for 1938, £304,410; final ordinary dividend of 12 per cent., making 16 per cent. for the year.

Federated Foundries, Limited.—Dividend on the 5 per cent. cumulative preference shares for the half-year to December 31 last. No payment is to be made on the ordinary £1 shares.

Hammond Lane Foundry Company, Limited.—Profit for 1938, after providing for depreciation, £20,940; available after taxes, £14,547; brought in, £3,197; dividend of 15 per cent. on the ordinary shares; to general reserve, £1,050; carried forward after preference dividend, £2,279.

"Carronade" for World's Fair

Carron Company have despatched to the New York World Fair one of the famous naval guns called "Carronade," invented at Carron in 1778 and manufactured there until nearly midway in the 19th century. The "Carronade" which has gone to New York is No. 63,991, and was cast at Carron in 1803. The customary position in which this gun stands is in the grounds in front of Carron Grange, residence of Mr. George Pate, manager of the Carron Company. In co-operation with the Department of Overseas Trade, the Federation of British Industries is arranging the "Hall of Metals," in the British Government Pavilion at the World's Fair, in which an endeavour is being made to convey an idea of the basis of industry in regard to which credit attaches to Great Britain. The leading "theme" of the Hall is illustrative of the progress of iron and steel, and the basic improvements made in their production which have been due to British invention. The display covers the introduction of coal and coke smelting, the hot blast, the mechanical production of wrought iron, Bessemer steel, and on to alloy steels, and will include exhibits of some of the earlier articles made in cast iron, such as cannon, fire backs, fire dogs, and, in fact, anything which is interesting and decorative of the early and pre-mechanical period. Certain of the articles required have been given on loan from the Tower of London and from the Victoria and Albert Museum, and the "Carronade" loaned by the Carron Company will be featured in this display. The modern side of the exhibit will contain various articles likely to be of interest to Americans to illustrate stages in the development of the iron and steel industry in which the production of motor-cars, bicycles, etc., became possible.